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Eugenics Quarterly

Vol. 5 June, 1958 No. 2

CONTRIBUTIONS OF THE FIRST INTERNATIONAL CONGRESS OF HUMAN GENETICS
Jean Sutter, M.D.

THE CHANGING NATURE AND INSTABILITY OF REMARRIAGE
Thomas P. Monahan

BIOCHEMICAL STUDIES IN SCHIZOPHRENIA
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CONTRIBUTIONS OF THE FIRST INTERNATIONAL CONGRESS OF HUMAN GENETICS

An Analysis of the Proceedings*

JEAN SUTTER, M.D.
Institut National d'Etudes Démographiques, Paris

The editors of these reports should be congratulated for they have succeeded in classifying some 213 communications in a very satisfying way. To read them is refreshing. Human genetics, a young science with great promise, is developing rapidly and the field of scientific activity which it encompasses is constantly being extended. At one extreme, the genetics of population, in order to assess the mode of genic dispersion in isolates, has reached the point of taking account of data as complex as those of cultural anthropology, while at the other, under the influence of biochemical research, we note the gradual formulation of a molecular genetics. Between these two extremes, within which lie all the phenomena of human life, countless areas are being defined in which specialists and doctors are exercising their talents. The original contributions of the congress and the bearing they have on future studies in human genetics will be considered here.

Our analyses will start with cytological and chemical genetics and then take account of more complex areas.

FORD and HAMMERTON explain how technical development led us to discover that man has only 46 chromosomes instead of 48 as held in the classical view— (T JIO). SACHS, DANON, FELDMAN, SERR, RIIS, FUCHS, JOHNSEN, and MOSBECH have shown in several communications what may be hoped for from a new cytological technique, which consists of examining the cells of the amniotic fluid, which can be extracted during the twelfth week of pregnancy. By this means we can determine the sex of the infant, its blood group, possible incompatibilities, anomalies of the chromosomes, etc. This method, which is steadily being developed, can have great importance from the point of view of eugenics, since it permits in certain cases prenatal detection of an hereditary anomaly.

In a very interesting report, R. J. WILLIAMS shows that, just as there exist important anatomical differences between one human organism and another, the same is true in the areas of the blood groups, enzymes, excretions, nutrition, and physiological and pharmacological sensitivity to different chemical products. Individual structures are the expression of genic differences, not only in taste sensations in P.T.C. but for a large number of substances.

Enzymes. A specific enzyme controls the congenital inability to utilize galactose (ANDERSON). The heredity of the osteoarticular system, in GIORDANO'S histological researches, points toward enzymes.

EDGAR studies disturbances in the metabolism of lipides; BEAR, the question whether the deficiency which causes Wilson's disease is principally that of copper or of an amino-acid. PFÄNDLER describes metabolic disturbances in porphyria, cysti-

Proceedings of the First International Congress of Human Genetics, Copenhagen, August 1-6, 1956. Edited by Tage Kemp, Mogens Hauge and Bent Harvald. Published in 5 parts, each of which can be obtained separately. S. Karger, Basel, New York, 1957.

nosis, and Niemann-Pick's disease. LEHMANN shows the existence of a *pseudocholinesterase* of genetic origin. YI YUNG HSIA and his collaborators show that heterozygotes carrying the phenylcetonuric gene oxidize phenylalanine less easily than other individuals; LEUCHTENBERGER and his collaborators, that in the hereditary type of rectal polypoida there exists an evident excess of DNA; TAILLARD and his collaborators, that congenital rachitis is a phosphoretted diabetes due to a dominant gene. Carriers can be detected. CODOUNIS presents a satisfying genetic study of cyanosis due to methemoglobin.

The medical section includes practically the whole field of medicine.

Heredity and the development of congenital athyreotic myxedema gives rise to an interesting discussion between BERNHEIM, BERGER, UZAN, CHAMBRON, on the one hand, and MOSBECH, BARTELS, UHRBRAND, on the other. The parents and relatives of myxedematous children have thyroid disturbances (even if they seem normal), which are discoverable by radioactive iodine. Certain facts are still under discussion. Diabetes mellitus, a very interesting disease from the viewpoint of eugenics since it occurs so frequently, was the subject of two very important papers. PYKE shows that the preponderance of this disease among females applies to married woman; unmarried women react like men. He concludes that parity is responsible for this condition and not obesity or the menopause. DITZEL, WHITE, and SARGEANT have investigated the number of diabetics borne by 100 diabetic women who are married and mothers of families; they have observed 375 times more diabetics in offspring of diabetic mothers than in the general juvenile population. The importance of this discovery can be well imagined in the area of natural selection and in the maintenance of genic balances in a population!

Neurology. There are about ten papers on neuromuscular dystrophies. Agreement among specialists on this difficult question is not complete. WALTON, for example, notes that the present classification has always been subject to question; he proposes a new one closer to reality. We should note a review by BECKER on the genetics of muscular dystrophy.

Psychology-Psychiatry. FULLER gives evidence, from comparative animal studies, as to the part of genetics in determining behavior. MAXWELL, in an all too brief communication, presents documents concerning 654 families, in order to resolve the problem of the relations existing between the intellectual level of parents and children. JUEL-NIELSEN announces the coming publication of a study of nine pairs of twins brought up separately—a rich contribution to a question which intrigues psychologists. We should also note two reports by KALLMANN and his collaborators, one on the evolution of intellectual faculties among maturing MZ twins, the other on the psychogenetics of personality organization, still by means of the study of twins.

Alcoholism was the subject of two papers. In one, KAIJ studies severe alcoholism in 174 pairs of twins. DEUSSEN considers the heredity of criminality by studying the cases of 500 young delinquents.

In psychiatry proper we note a remarkable and exhaustive study by A. J. LEWIS on the offspring of parents, both of whom are afflicted by mental illness. His personal documentation is important. In a related area REED studies the importance of the heredity of mental deficiency in 150 complete pedigrees. He confirms that, in the course of generations, the anomaly tends to decrease. The non-affected children have I.Q.s which measurably approach the average of the population. In both cases, the problem of mutations in the psychical order is presented. MITSUDA admirably states the problem of the homotypia of the great psychiatric syndromes: schizophrenia, manic-depressive psychosis, epilepsy. The pathological effects of consanguinity were the subject of several presentations. SLA-

TER (England), ÖDEGAARD and HERLOFSEN (Norway) arrive at rather opposite results: the former found evidence of the predominance of schizophrenia, the latter two that of manic-depressive psychosis. LARSON studies the cases of mentally deficient offspring in relation to control groups. PHILIPSEN points out that, in Denmark, 400 pairs of twins are available for the study of mental illnesses by this method. KALLMANN shows, in another area, the significance of the method in the study of mongolism. OSTER gives an excellent summation of the etiology of mongolism.

Ophthalmology. Papers here were relatively numerous, ranging from the particular to the general. We shall limit ourselves to the most important facts and the most instructive monographs. FRANCESCHETTI and KLEIN have reported the case of a family—a very interesting one for genetic theory—where a pronounced form of Daltonism was inherited. WAARDENBURG describes the six different classes of hereditary optic atrophy, SORSBY the dominant lesions of the fundus, etc.

Cancers. KOLLER emphasizes the rôle and the importance of mutation, variation, and adaptation in neoplastic growth. The masses of cells must be thought of as an ordinary population with all its characteristic qualities. This is an interesting concept for understanding findings which often seem so contradictory in this field of study. MORGANTI, GIANFERRARI and their collaborators have shown that only certain cancers seem to have a familial incidence. An interesting account is presented by PELLER of cancer in children, the rate of which is relatively high. NIELSEN shows that, in Denmark, 849 pairs of twins are available for the study of cancer.

Bones and Joints. Into this still obscure area three papers have brought some clarification (STECHER, DE BLECOURT-MEINDERSMA, McKUSICK). THYMANN attempts to apply the method of twins to these studies. Polydactylism (DEMARINIS), short thumbs (STECHER), *dysostosis cleidocranialis* (WITKOP-OSTENRIJK) have also received attention.

Other reports to be noted are those which deal with abnormalities of the teeth (SCHULZE), of the enamel (WITKOP), the genetics of gargoylism and hemochromatosis (LAMY and collaborators), hereditary acromelalgia (HUIZINGA), the genetic aspects of atherosclerosis (ADLERSBERG) and congenital cardiopathies (KHERUMIAN and collaborators).

Experimental pathology. NACHTSHEIM gives an excellent summation of the possibilities of animal experimentation for securing data on human genetics of which MOTULSKY (hemolytic anemia), DEGENHARDT and VETUKHIV give examples.

Physical anthropology. Unfortunately, the papers here were not numerous. SARAH H. HOLT concludes, from her many studies on fingerprints, that they are doubtless determined by a small number of genes; intercorrelations among characteristics are rare. PONS also emphasizes the striking independence existing among the elements. HARRESON and OWEN suggest a spectrophotometric technique permitting scientific estimates of skin color; TANNER, that the rate of growth and the height of the adult are independent; TWISSELMANN, that during their growth, mulattos of the Belgian Congo have anthropometric characteristics which are nearer the Negro than the white.

Blood groups is the area in which most new concepts have been developed in recent years (FISHER). Emphasis has been laid upon their geographic and anthropological distributions (for the more common groups, MOURANT, for the rarer ones, LEVINE), but the field of incompatibilities has been markedly enlarged: the ABO incompatibility in the hemolytic disease of the newborn (WOOLF) and a very important addition which seems quite definitive —the associations between blood groups and diseases of the digestive tube. FRA-

SER-ROBERTS gives a masterly summation of the question, but those of BUCK-WALTER, CLARKE and SHEPPARD, and BENTALL, on the same subject, are also of great interest. This new field of genetics seems to be developing rapidly. Already ZEITINOGLU has found a relationship between diabetes mellitus and ABO-Rh, McCONNELL and SHEPPARD between the secretory characteristic and digestive ulcers, MAYR and his collaborators between certain groups and chromatophobe adenoma of the pituitary. The application of blood groups to legal medicine is being actively promoted. Very complete reports on the detection of paternity were made by K. SALLER, HARRASSER, WICHMANN, JONSSON, GÜRTLER; BAUMEISTER allies the blood groups to a more purely biometric method of identification of paternity.

Mutations. The report of H. J. MULLER, as well as that of L. S. PENROSE, presented to the congress two rather opposite concepts, already familiar to experts. For MULLER, mutations are a real burden. The genic balances of the centuries, already gravely upset among human populations by the disappearance of natural selection, risk being even more disturbed by the probable increase of mutation rates as a result of radiation. All this creates a real threat to the species. In basic agreement, PENROSE believes that possible damage due to medical and industrial uses of radiations can be combated by Western public health methods which are now spreading throughout the entire world. Although holding somewhat opposed views on the danger of induced mutations, MULLER and PENROSE are in agreement on the necessity of research to support their positions, which still remain at a theoretical level.

T. C. CARTER, also, admirably states the "empiric" problem. He shows that much remains to be done in order to evaluate the effect of radiation. It is important to be aware of two aspects: the genesis of mutants and their elimination; the latter has been studied very little. It is doubtless wrong to put too much faith in mathematical patterns which may differ greatly from the actual situation. In order to evaluate the speed of the elimination of mutants, it is necessary to know the elements which come into play in the balance established between mutation and selection, on the one hand, and in that which is determined by opposing forces of selection, on the other, when, for example: (a) the heterozygote is at an advantage; (b) or is the central phenotype in polygenic systems; (c) a variation in time or space exists as a function of the environment. These last three circumstances, together with the fact that the heterogeneity of human populations is deep-seated, lead us to think that the danger arising from an increase in the mutation rate has doubtless been overestimated, but there is much work to be done to establish this conclusion. Concerning the effect of radiation, which follows naturally from the preceding considerations, it must be recognized that the study of the offspring of individuals exposed to radiation at Hiroshima and Nagasaki has not produced the brilliant certitude expected. J. V. NEEL and W. J. SCHULL, who directed this large investigation, state: "In order to avoid all possible misunderstandings we hasten to state that under no circumstances can this study be interpreted as indicating that there were no genetic consequences of the atomic bombings. The interpretation is simply that *conclusive* effects could not be demonstrated." The first results from an investigation on a much more modest scale by TURPIN, LEJEUNE and RETHORE, on the offspring of 786 subjects treated by pelvic radiotherapy, cause their authors to be equally reserved: "Given the relative inconclusiveness of our sampling and the scantiness of absolute figures, the facts reported cannot constitute a formal proof of the production of mutations in man by ionizing energy, but this latter hypothesis can be considered

the only 'probable' explanation of the peculiarities observed." Elsewhere, BRANDT shows how the different geographical areas of the United States are affected differently by the radioactive fallout which follows experimental explosions; this is of great interest for geneticists.

The numerous papers and discussions related to the genetics of population reveal the vigor with which this important branch of genetics is developing. HALDANE brings forward the problem, fundamental for man, of natural selection; COOK, as well as McKEOWN, shows how old-time genic balances are disturbed by demographic changes of the industrial era. F. OSBORN describes historical changes in demographic factors, which are of essential interest for the genetics of population. He studies in succession differentiation in the death rate and in the birth rate, mate selection and the break-up of isolates, or fusion of multiple partial populations into larger populations. Tage LARSSON groups demographic influences into thirteen factors, whose reciprocal action control the genetic compositioin of populations. AUBENQUE reports how census data can serve genetics; ASCHNER and POST, showing first how modern therapy disturbs the old balance of genetic disorders, estimate the possibilities of the extension of diabetes mellitus. In five to ten generations, doubling of the frequency of *dd* homozygotes may be seen, which confirms the study by DITZEL and his collaborators previously reported.

The editors have gathered practical applications of the models of the genetics of population under one heading: Genetic Implications of Demography. In this very promising area are two excellent accounts, one by LEHMANN, the other by A. C. ALLISON, who evaluate studies of genetics of population on abnormal hemoglobins. GARTLER and his collaborators show how β-amino-iso-oxybutyric urinary acid is distributed.

The study of isolates proper is the subject of many communications. SUTTER and TABAH show how methodology must henceforth adapt itself to the multiple conditions offered by the framework of consanguinity within groups of different types. CAVALLI-SFORZA reports show he studied, from 1927 to 1951, the evolution of marriage customs in 273 parishes of the province of Parma. Isolates are also discussed in the following studies of demographic genetics: Polar Eskimos (SUTTER and TABAH), the Dinkas (ROBERTS); blood groups of the Malagazy of Madagascar (SINGER and BRAIN); the Copts and Mohammedans of Egypt (SOLIMAN); the inhabitants of Easter Island (WILHELM and SANDOVAL); the Dutch according to their religion (OOSTINGH); the French Basques (NIJENHUIS), and the Basques of Idaho (LAUGHLIN and his collaborators.) C. J. WITKOP indicates that, in the United States, 28 well-defined isolated groups are now established. The study of one of these, which comprises 5,000 persons of three different races, furnishes material so important that to many this work has been a revelation. GINI brings out interesting facts on the physical assimilation of immigrants in Italy and the disappearance of the Nordics who settled in Greenland.

We have surveyed the field covered by human genetics during the congress. The methods which were the subject of a special session should now be noted. The twin method was the subject of two reports: VON VERSCHUER on the general results which we owe to it, WAARDENBURG on its value in itself. The latter questions, *in toto*, the absolute value ascribed to it a few years ago. The interesting communication of MIJSBERG, adducing the possible existence of a third variety of twins, confirms these reservations. WALKER reminds us of the number of means at our disposal to determine the category to which they belong. SIMONDS presents 300 cases of tuberculosis among twins and their families.

Consanguinity as an indirect method of estimating the frequency of recessive genes

was utilized by BÖÖK (morbidity), SLATIS and REIS (lethality), RÜDIN (anomalies).

In summation, methodology was weakly represented, which is greatly to be regretted, for, although brilliant, this first congress did not proceed without revealing certain weaknesses, specifically in the area of technique. In general, little pioneering was observed in acute problems, such as linkage, polygenic heredity, phenomena of association, biometric and statistical analysis and others. Linkages were the subject of only a few reports: multiple allelomorphic genes (OAKLAND), congenital ptosis among MNS, blood groups (HÖSLI, HÄSSIG, FRANCESCHETTI); aphasia of the Vertex and blood groups (HURON and his collaborators). Polygenic heredity was the subject of only one paper by KEITER; rarely was it alluded to, except by KALLMANN and the anthropologists. Biometric analysis was the subject of only a brief report by C. A. B. SMITH. It is possible, fortunately, to judge elsewhere the importance of the subject of distributions, since both MIALL and OLDHAM and FRASER-ROBERTS have shown that arterial tension, as it is studied in medicine, represents only the tail of a normal distribution. This is surely an important finding. The report by BERGLIN on the measurement of penetrance permitted BATEMAN to show a certain confusion prevalent in regard to the principle itself. The debates frequent in medical discussions as to whether a characteristic is dominant or recessive have amply shown that classic Mendelian technique is uncertain in its application to man. CUENDET and STREIFF have even questioned dominance and recessiveness in favor of an intermediate heredity. As a result of all this, the most modern methods have not yet penetrated far enough into the area of genetics, especially medical genetics; specialists must be developed as quickly as possible on a broader basis.

We regret, finally, that eugenics occupied only a very small place in this congress. SKYDSGAARD discussed the eugenics of blindness with a view to prevention; VAN ZONNEVELD and POLMAN, the hereditary factors in longevity. This is not a great deal of material, even if one adds the important report by REED on heredity counseling and its social usefulness. However, does not the future depend on our knowledge of the normal man and on study of the best stock? For a sound eugenics to develop, it is urgent that genetics find its place in every course of study, as GORDON remarked, and that the public be better informed on its problems (SCHEINFELD).

THE CHANGING NATURE AND INSTABILITY OF REMARRIAGES

THOMAS P. MONAHAN
The Municipal Court of Philadelphia

IT HAS BEEN A FUNDAMENTAL BELIEF in our society that the family is the cornerstone of social structure and that man, woman and child achieve greater personal and social development in the family than they could under any other auspices. Marriage, therefore, has been highly esteemed from early times and, as compared to other countries, the great majority of Americans have entered into the matrimonial state at an early age.[1] In our history the remarriage of widows and widowers (which served to reestablish the family bond) was likewise universally acclaimed. None other than the first president of the United States, George Washington, married a "warm widow" (as a rich one was called).[2]

Even though the laws of some of the colonies contained provisions for social dissolution of marriage and for remarriage of the innocent party, especially in case of desertion, divorce as we know it today was relatively rare in early America. In many states it could be obtained only by an act of the state legislature.[3] Divorce was uniformly socially disapproved and soon came to be denounced as an open encouragement to "successive polygamy."[4] The remarrying of the guilty party in particular was something to be prohibited or restrained, a view still strongly held in ecclesiastical circles. Remnants of this moralistic attitude are apparent even yet in certain aspects of our divorce laws. One rather modern text on the family (1943) declares, "There is rarely an innocent party to a divorce case."[5] In general, however, the attitude is growing today that, if a married couple cannot get along, by mutual consent they are entitled

[1] Thomas P. Monahan, *The Pattern of Age at Marriage in the United States* (Philadelphia: Stephenson-Brothers, 1951).

[2] Fairfax Downey, *Our Lusty Forefathers* (New York: Charles Scribner's Sons, 1947), pp. 15, 40; Arthur W. Calhoun, *A Social History of the American Family*, Vol. I and II (Cleveland: Arthur H. Clark Co., 1917); Alice M. Earle, *Colonial Dames and Goodwives* (New York: Houghton, Mifflin and Co., 1895), pp. 29-39; Monahan, *op. cit.*, pp. 50-64, 301-07.

[3] J. H. Trumbull, *The True-Blue Laws of Connecticut and New Haven* (Hartford, Conn.: American Publishing Co., 1876), pp. 216-17; Joel P. Bishop, *Commentaries on the Law of Marriage and Divorce* (Boston: Little, Brown and Co., 1852), p. 19; S. P. Breckenridge, *The Family and the State* (Chicago: University of Chicago Press, 1934), pp. 489-93; James H. Barnett, *Divorce and the American Novel, 1858-1937* (Philadelphia, privately published, 1939), pp. 16-21; Auguste Carlier, *Marriage in the United States* (Boston: DeVries, Ibarra and Co., 1867), pp. 111, 176-77; Matteo Spalletta, "Divorce in Colonial New York," *New York Historical Society Quarterly*, XXXIX (October, 1955), 422-40; George E. Howard, *A History of Matrimonial Institutions* (Chicago: University of Chicago Press, 1904), Vol. II, pp. 328-87.

[4] Rev. H. Loomis, "Divorce Legislation in Connecticut," *New Englander and Yale Review*, XXV (July, 1866), 436-53; Editorial item, "Frequent Divorce in New England," *American Quarterly Church Review*, XX (July, 1868), 226; Leonard W. Bacon, "Polygamy in New England," *Princeton Review*, X (July, 1882), 39-57; Howard, *op. cit.*, Vol. III, pp. 218-19, 250; Rev. Walker Gwynne, *Divorce in America under Church and State* (New York: Macmillan Co., 1925), p. 155. Cf. Morris Ploscowe, *Sex and the Law* (New York: Prentice-Hall, Inc., 1951), pp. 63, 76.

[5] Paul Popenoe, *Modern Marriage* (New York: Macmillan Co., 1943), p. 114. Compare, E. J. Phelps, "Divorce in the United States," *The Forum*, VIII (December, 1889), 351-52; Bishop Doane in "How Shall We Solve the Divorce Problem," *The World Today*, XXI (June, 1912), 2394; H. Pilpel and T. Zavin, *Your Marriage and the Law* (New York: Rinehart and Co., 1952), pp. 30-32, 322-26; and Jessie Bernard, *Remarriage, A Study of Marriage* (New York: Dryden Press, 1956), p. 10.

to a divorce after they follow the legal ritual and pay the necessary fees, in much the same way that they qualify for a marriage license or dissolve a civil contract.[6]

Early reformers had propounded that one way to reduce the divorce rate would be to remove the possibility of remarriage. However, the overriding right to marry whom one pleased, in the American tradition, made it impossible under common law and the States' rights provisions in the Constitution effectively to prohibit those who had their marriages legally dissolved from marrying again in one State or another. As yet, there is no limit to the number of spouses a person might legally acquire in a lifetime under our divorce system. Nor is this type of serial marriage behavior reserved for entertainers or persons of affluence, such as Tommy Manville who was reported to have had a dozen wives by the age of 58. One woman of modest means is said to have obtained her 15th divorce in Oregon at the age of 40, and another 27-year-old Tennessee woman already has achieved 16 divorces; while, between them, another couple accounted for 21 marriages.[7]

CHANGES IN REMARRIAGE

Until recently, although there are no reliable statistics on the subject in this country, it had been the consensus that most divorcees did not remarry. Many well-known writers subscribed to the guess that only about one-third remarried, while some others estimated it to be about 50 per cent and as high as 88 per cent.[8] Available statistics do not easily lend themselves to an exact determination of the proportion of the divorced or widowed who ultimately remarry, now or in the past. In spite of the uncertainty of the information on "divorce," the data we do have, however, give considerable support to the new pronouncements that a large proportion of the divorcees remarry, perhaps as high as three-fourths.

In contrast to colonial times when widowhood accounted for nearly all remarriages, in the last few generations a new element has interposed itself into the American marital pattern—namely, the gradually swelling tide of remarrying divorcees. This drastic change is illustrated in the charts showing the nature of remarriages in the contiguous states of New York and Connecticut.[9] Data from a number of other states and cities extending over a period of

6 Margaret Mead, *Male and Female* (New York: William Morrow and Co., 1949), pp. 354-63; Maxine B. Virtue, *Family Cases in Court* (Durham, North Carolina: Duke University Press, 1956), p. 145; C. O. Herd, "Notes from the Temple: Law Reform—Marriage and Divorce," *Journal of the American Bar Association*, XLIII (February, 1957), 122; and Kingsley Davis in M. Fishbein and R. Kennedy, eds., *Modern Marriage and Family Living* (New York: Oxford University Press, 1957), p. 103.

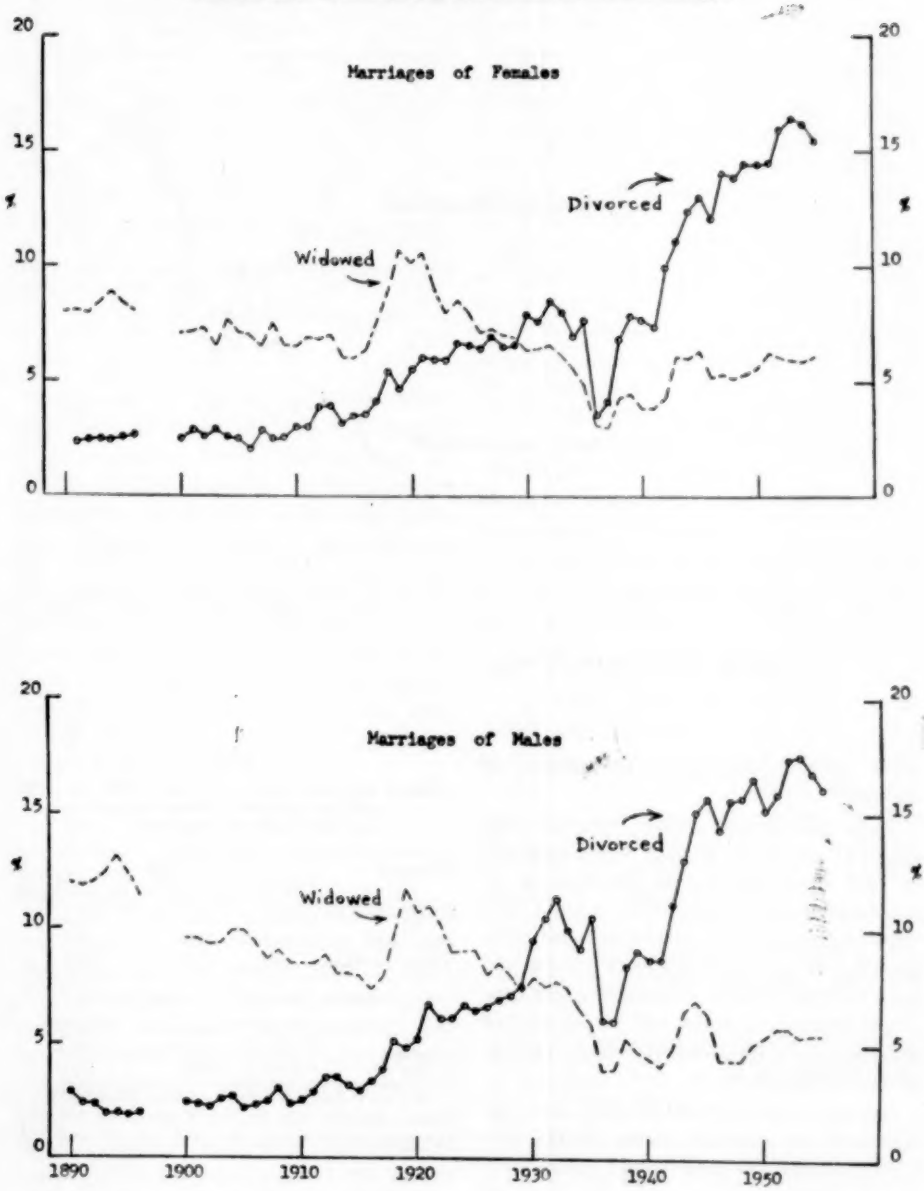
7 Clarence Kolwyck, Chrm., "Chattanooga Divorce Report," *The Chattanooga Times*, Sunday, November 24, 1946, p. 24, col. 7, and *Tennessee Law Review*, XIX (1946-47), 958; and *Philadelphia Evening Bulletin* news items, February 24, 1953, October 10, 1947, and March 8, 1957.

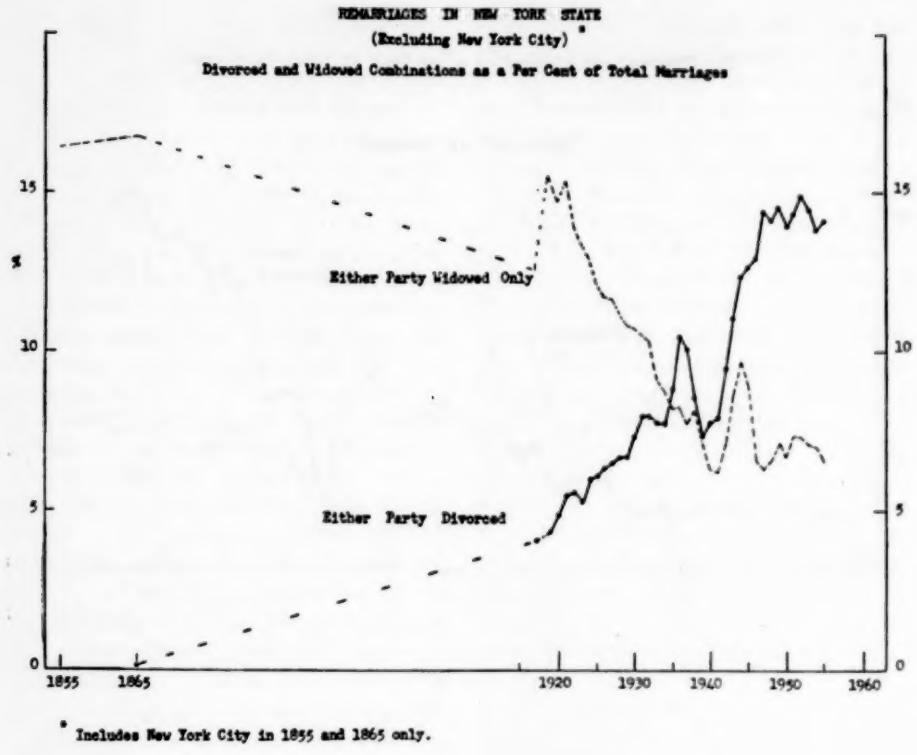
8 Alfred Cahen, *Statistical Analysis of American Divorce* (New York: Columbia University Press, 1932), pp. 98-109; Popenoe, *op cit.*, p. 118; Willard Waller, *The Family, A Dynamic Interpretation* (New York: The Cordon Co., 1938), p. 531; E. R. Groves and W. F. Ogburn, *American Marriage and Family Relationships* (New York: Henry Holt and Co., 1928), pp. 363-64; Ray E. Baber, *Marriage and the Family* (New York: McGraw-Hill Book Co., 1939), pp. 475-79; Paul C. Glick, "First Marriages and Remarriages," *American Sociological Review*, XIV (December, 1949), 730, and *American Families* (New York: John Wiley and Sons, 1957), p. 139; and United States Bureau of the Census, *Population—Special Reports*, P-46, No. 4, June 1, 1946.

9 *Census of the State of New York for 1855* (and *for 1865*), Secretary of State, Albany, New York, 1865, p. xcv, and *Annual Reports of the Division of Vital Statistics*, State Department of Health, Albany, New York; *Annual Registration Reports, Division of Vital Statistics*, Connecticut State Department of Health, Hartford, Connecticut. According to some data in the early 1900's, New York City, with its large Catholic and Jewish population, seems to have lagged behind up-state New York in the extent of divorce among persons remarrying. However, by 1940 the two jurisdictions were not far apart (cf., National Office of Vital Statistics, *Vital Statistics—Special Reports*, Vol. 15, No. 19, and Vol. 17, Nos. 9 and 13). New York City currently publishes no statistics. Because of migratory-marriage effects state data cannot be accepted as being precisely definitive.

REMARRIAGES IN CONNECTICUT

The Divorced and Widowed as a Per Cent of Total Marriages





* Includes New York City in 1855 and 1865 only.

years further substantiate the pattern of change.[10]

Some *population* survey data on marriages in all of the United States gathered in 1953 disclosed that 30 per cent of all marriages from January 1950 to April 1953 were remarriages for either party and in 13 per cent of all marriages both parties had been married before. Seventy-five per cent of the remarrying males and 70 per cent of the remarrying females had been *previously* divorced (Table 1).

A compilation of statistics from *marriage* records in 21 reporting states for the year 1954 indicated the same thing: about three out of four persons who remarried had been divorced, and in a higher proportion of cases at least one of the parties had been divorced (Table 2).

TABLE 1

PERSONS MARRIED DURING JANUARY 1950 TO APRIL 1953 BY NUMBER OF TIMES MARRIED. PER CENT DISTRIBUTION*

Husband	*Wife*		
	Total	Once Only	Twice or More
Total	100.0	77.7	22.3
Once Only	79.6	70.1	9.5
Twice or More	20.4	7.6	12.8

Previous Marital Status of Remarried

	Total	Divorced	Widowed
Grooms	100.0	74.6	25.4
Brides	100.0	69.9	30.1

*National Office of Vital Statistics, *Vital Statistics-Special Reports*, Vol. 39, Nos. 3 and 5, pp. 108, 210. Compare to Glick, *op. cit.*, 1957, pp. 141 and 144.

10 For example, Maine, New Hampshire, Rhode Island (and Providence), Wisconsin (and Milwaukee), and others. See Ruby Jo Reeves, *Marriage in New Haven Since 1870*, unpublished Ph.D. thesis, Yale University, 1938, pp. 1-17, IV—1 to 13.

TABLE 2

MARRIAGES IN 21 REPORTING STATES BY PREVIOUS MARITAL STATUS
1954

Percentage Distribution *

Husband	*Wife* Total	Single	Widowed	Divorced
Total	100.0	75.9	7.0	17.1
Single	77.1	68.4	1.8	6.9
Widowed	6.2	1.4	3.1	1.7
Divorced	16.7	6.1	2.1	8.5

*Eliminating cases of marital status not reported, one or both.

SOURCE: National Office of Vital Statistics, *Vital Statistics—Special Reports*, Vol. 44, No. 6, p. 130.

Approximately the same relationship holds for 23 states in 1955

Explanation for the change in the nature of remarriage is two-fold. With the increase in life expectancy widowhood has been occurring at older ages when eventual remarriage is less likely and, at the same time, divorce has been becoming more common for American couples at the younger marriageable ages. As a result divorcees predominate among those who remarry. Actually, if it had not been for the rise in divorce in the earlier years of life, the over-all proportion of remarriages would have been on the decline in the past 50 years in the United States.[11]

THE SUCCESS OF REMARRIAGES

Present Interest

Americans are not merely interested in achieving the state of marriage; they are also eager to be successfully married, with divorce being an unintentional and unpremeditated outcome. The allegation that the prospects of a successful or a happy marriage for divorcees were poor (according to some cogent reasoning and selected 'case studies) was an acceptable conclusion in sociological and popular literature at one time—when divorces were fewer and held in low esteem.[12] In view of the swelling tide of remarriages of divorcees and the apparent success of many of them, and the more tolerant public attitude nowadays, sociologists are reporting more favorably upon this class of remarriages, in support of which viewpoint some rather selected kinds of data are offered in evidence. The push to make divorce acceptable is growing, but, as yet, there is no espousal of the novel idea expressed years ago (1924) by a judge who averred that "Every divorce makes four people happy." [13] One authority on divorce, however, was recently credited with the statement, "There is no question now that second marriages are happier than first marriages . . . (and) the percentage of failures is less among all second marriages than among all first marriages."[14] This conclusion is shared by others but is in direct opposition to certain facts and needs careful evaluation.

The magnitude of the problem and the intricate psychological and sociological character of present-day remarriages will soon lead to an exploration and development of this field by social scientists. Some recent family textbooks, it is true, give it hardly any treatment at all; on the other hand, two monographs published in 1956 deal entirely with this subject. Unfortunately, we have very little refined *and* comprehensive data on remarriage and the literature contains many contradictions which have yet to be resolved.

[11] Paul H. Jacobson, "Differentials in Divorce by Duration of Marriage and Size of Family," *American Sociological Review*, XV (April, 1950), 235-44.

[12] W. Waller, *The Old Love and the New* (New York: Horace Liveright, Inc., 1930), pp. 157-58, and *op. cit.*, 1938, p. 566.

[13] R. L. Hartt, "The Habit of Getting Divorces," *World's Work*, XLVIII (August, 1924), 407. Cf., A. Q. Maisel, "What Divorce Crisis?", *McCall's*, LXXV (August, 1948), 18ff.

[14] William J. Goode cited in E. M. Duvall and R. Hill, *When You Marry* (New York: Association Press, 1953), p. 291—a widely used pre-college text. Cf., Bernard, Goode, Monahan, Popenoe, cited herein; J. H. S. Bossard, *Parent and Child* (Philadelphia: University of Pennsylvania Press, 1953), pp. 149-50; and M. F. Nimkoff in *Conference on Divorce* (Chicago: University of Chicago Law School, 1952), Conference Series No. 9, p. 61.

Complexity of Problem

The social configurations and consequences resulting from remarriages of the divorced as compared to the widowed are remarkably different, howsoever regarded. To mention only a few aspects of the divorce relationship: the presence of children by prior marriages and the special custody and support arrangements for them, the existence—if not nearness—of former spouses, the still antagonistic community attitude toward divorce, and the personal trauma and sometimes bitterness engendered by the divorce experience—all offer peculiar complications in a divorce remarriage.

When it is seen that the three marital types (the single, the widowed, the divorced) intermarry, and that either party may show a complex history (once divorced and once widowed; twice divorced; etc.) a virtual kaleidescope of patterns comes into view. Since the total marital experience of the individual influences his behavior, from the psychological side alone the need for specificity in the study of remarriage classes appears to be of paramount importance in any research on marriage and remarriage. Strangely enough, although some research workers have made this point rather clear, most of the major studies in this field have failed to make use of such distinctions.[15]

Need for Demographic Data

For years sociologists have not expressed or exerted themselves as a professional group to have marriages and divorces registered in such a fashion as to permit the assessment of the fundamental facts of marriage, divorce, and remarriage. To a considerable extent, because of this lack of concern, this area of vital statistics has not been developed satisfactorily, and even elemental information on marriage and divorce is still wanting in this country.

A comprehensive question on the full marital history of both parties to a marriage or a divorce is a *sine qua non* for registration if we are to get broadly useful data on remarriage in the United States. Early proponents of registration and statistics recognized the value of such an item. The legal and statistical arguments for keeping such a record are so apparent that they require no special pleading. However, the reluctance of some state officials to inquire about marital background in their design of the standard forms for nationwide marriage and divorce registration has caused the proposed item to be grievously modified, permitting as an answer *either* the number of the marriage *or* the nature of the last marital dissolution. A uniform pattern enabling differentiation of the specific type of remarriage is thus impossible from state to state under the presently operating scheme. The prospects do not look good, therefore, for a completely adequate investigation of American remarriage in the near future from registration records.*

Some Studies of the Instability of Remarriages

A recent article summarized the literature on the subject and presented all the data available on remarriage and divorce within two states, which gave indication that remarriages have been less stable than first marriages for some time, and that the fra-

[15] Walter F. Willcox, "Proportion of American Marriages Ending in Divorce," *Publications of the American Statistical Association*, XIV (March, 1915), 485, and *Studies in American Demography* (New York: Cornell University Press, 1940), p. 350; Monahan, *op. cit.*, 1951; W. M. Kephart and T. P. Monahan, "Divorce and Desertion in Philadelphia," *American Sociological Review*, XVII (December, 1952), 723; T. P. Monahan, "How Stable Are Remarriages?," *American Journal of Sociology*, LVIII (November, 1952), 280-88, and "Does Age at Marriage Matter in Divorce?," *Social Forces*, XXXII (October, 1953), 82; and others. Cf., August B. Hollingshead, "Marital Status and Wedding Behavior," *Marriage and Family Living*, XIV (November, 1952), 308-11.

* Document No. 452 of the Public Health Conference on Records and Statistics, dated March 21, 1958, states that items on place of birth, usual occupation, and number of previous marriages "should not be required for admission to the DARA"—the national divorce and annulment registration area, established January 1, 1958.

gility increased as the number of the marriages increased.[16] A scattering of registration data in other areas can be found to support this position. Since the publication of that article a few other states have modified their program and have brought forth data of the same kind which (although suffering from incompleteness in part) substantiate the 1952 findings on remarriage as a whole.[17] In the past year, as mentioned above, two monographs have been published which treat of the success and stability of remarriages and also elaborate on many other phases of the subject, upon the basis of rather specially drawn samples of remarriages.[18]

IOWA DATA

Only two or three states gather records showing the marital background of couples entering into marriage or being divorced. In Iowa a rather full marital history of the parties is asked for on the new (1953) marriage and divorce forms for state registration. With the help of Mr. L. E. Chancellor, the Iowa State Director of Vital Statistics, it was possible to obtain tabulation sheets on both marriages and divorces according to prior marital history of the couples. Whereas, heretofore, we have been limited in our analysis to remarriages by the number of the marriage without regard to type, now we have for the *first time* information detailed according to widowhood or divorce. In the period 1953-1955 Iowa marriages totaled 70,901; divorces, 15,502.

Representativeness

Iowa is a fairly representative area in the mid-Western United States, with a strong agricultural base and a small-industry economy. An outward migration state, its population is over 95 per cent white, about one-fifth Catholic and less than one per cent Jewish; and Des Moines, with a population of 178,000 in 1950, is the only city with over 100,000 inhabitants. There seems to be a liberal attitude toward divorce and no special legal impediments are imposed against it, although remarriage within a year without court permission is technically prohibited by law. In spite of Iowa's agricultural emphasis and non-urban nature, the divorce rate per 1,000 population in 1954 was 8.7 compared to the national figure of 9.2. In 1954 the duration-specific divorce rates indicated the marriage fatality rate in Iowa to be about 21 per cent of all marriages.[19] All in all, even though it may not represent the condition prevailing in highly urbanized, industrial areas, or in other places characterized by a large nonwhite population, in its geographic region Iowa may be taken as a typical middle-American state.

The nature and accuracy of all data on marriage and divorce (and marital status) need careful appraisal, and familiarity with registration records gives one reason to be most cautious about small differences in findings. This matter and other methodological perplexities are variously discussed in the literature cited.

Nonresidence Differences[20]

When *marriages* were grouped according to residence a rather outstanding trait was disclosed, recalling the similar figures for Connecticut, New York, and other areas: nonresident brides and grooms registered a high proportion of prior divorce experience, 31 per cent, as compared to 13 per cent for those marriages in which both parties were Iowans. When *divorces* were

[16] Monahan, *op cit.*, November 1952. For an early study of an exceedingly small and selected sample see Hornell Hart, "Sex Antagonism in Divorce," *Proceedings of the National Probation Association, 1922* (New York: National Probation Association, 1923), p. 139.

[17] National Office of Vital Statistics, *Vital Statistics—Special Reports*, Vol. 44, No. 6, p. 120, and No. 7, p. 148.

[18] Bernard, *op. cit.*, 1956; W. J. Goode, *After Divorce* (Glencoe, Illinois: The Free Press, 1956).

[19] See, Iowa State Department of Health, *Annual Report of the Division of Vital Statistics, 1951* (Des Moines, Iowa), pp. 83-86.

[20] See Monahan, *op cit.*, November 1952, 282 ff.

analyzed, it was found that Iowans who married in contiguous states, or elsewhere, also showed a much higher degree of prior divorce. There is a confirmation here of a previously observed tendency for divorcees in general to be unconventional and to marry out of state, either to escape attention or to avoid state regulations on remarriage following divorce.

Comparison of Marriages and Divorces by Type

A simple linear comparison of the Iowa marriages and divorces by type (Table 4) shows an imbalance in the two series. Remarriages are more in evidence in the divorce side of the picture, and this is because of the divorced class and not the widowed class of remarriages.

While migratoriness in marriage and divorce occurrences, heretofore noted, creates a major dilemma in analysis of data for a particular state, for which there is no easy solution in the absence of a nationwide registration system which would permit reallocations of data, refinement of the Iowa data on the basis of residence does not alter the basic contrast in the two series (unpublished tables). In fact, if marriages in which either party is Iowan are compared to divorces of only those couples who were married in Iowa (a comparison certainly not favorable to the divorce recidivism thesis) the relationship is practically the same as for the whole.

Divorce Stability by Marital Background[21]

Population at Risk. For the calculation of the probability of divorce by marital type, customary Census data on the population structure by marital status are of no use (compare, for instance, Tables 1 and 2 with Table 3), and there is great doubt that the necessary details could be collected with sufficient accuracy in a decennial enumeration.[22] Because of the considerable tendency to successive remarriage, a large proportion of the presently married have a prior history of divorce or widowhood. The usual population enumeration does not delineate this, and thereby it greatly under-

TABLE 3

ALL MARRIED COUPLES BY NUMBER OF TIMES MARRIED UNITED STATES, 1948

Percentage Distribution *

Husband	*Wife* Total	Once Only	Twice or More
Total	100.0	87.5	12.5
Once Only	86.8	81.4	5.4
Twice or More	13.2	6.1	7.1

*This refers to couples living together.

SOURCE: United States Bureau of the Census, *Current Population Reports*, P-20, No. 21, December 19, 1948, p. 15.

TABLE 4

PERCENTAGE DISTRIBUTION OF MARRIAGES AND DIVORCES IN IOWA, 1953-1955, BY MARITAL BACKGROUND OF PARTY†

Marital Status of Person	*Husband* Marriage	Divorce	*Wife* Marriage	Divorce
No. of Cases	70,901	15,502	70,901	15,502
Total	100.0	100.0	100.0	100.0
First marriage	78.6	65.9	77.5	64.5
(Primary)	71.2	53.9	71.4	58.4
Remarriage	21.4	34.1	22.5	35.5
Divorced				
1	13.4	22.0	13.4	22.7
2	1.8	5.6	1.9	5.2
3&	.3	1.7	.4	1.6
Divorced and Widowed				
1 Div.	.7	1.0	.9	1.5
2 Div.	.1	.2	.1	.3
3& Div.	*	.1	*	.1
Widowed				
1	4.8	3.3	5.3	3.9
2	.3	.2	.4	.2
3&	*	*	.1	*
Div'ced (ever)				
1	14.1	23.0	14.3	24.2
2&	2.2	7.6	2.5	7.2

†Percentages adjusted for status not specified and rounded to add to 100.0.

*Less than 0.05 per cent.

[21] Divorce stability by number of times married for 1953-1955 was found to be essentially the same as the Iowa study findings in 1952, *op cit.*, and presentation of these data will not be made here.

[22] Glick, *op. cit.*, 1957, p. 141, says "Data on the specific number of previous marriages are probably subject to a larger percentage of error than almost any other aspect of marriage statistics. . . ." See also pp. 106, 109, 136, 139, and compare tables herein with those in Glick, pp. 141-46.

estimates the "risk" population of remarried persons of each type. Marriage records, on the other hand, allow the remarried to be counted again each time they enter into another category. Aside from the question of misreporting of true marital status in marriage and divorce records, if bias is to be imputed to divorce ratios calculated with reference to marriage figures, it could be that the method overestimates the size of the remarriage base (s) and thus underestimates the true proportion (s) of failure. For a short time span, however, such a bias should be small indeed. Unfortunately, in order to estimate the true proportions of the many types of marital combinations one encounters, a very much larger Iowa total would be needed.

Another qualification to keep in mind is that marriages of different types (exposed to the risk of dissolution) have different durations extending into the past and contracted under varying circumstances, not exactly represented by the recent 3-year marriage figures for Iowa used as the basis of the following calculations.

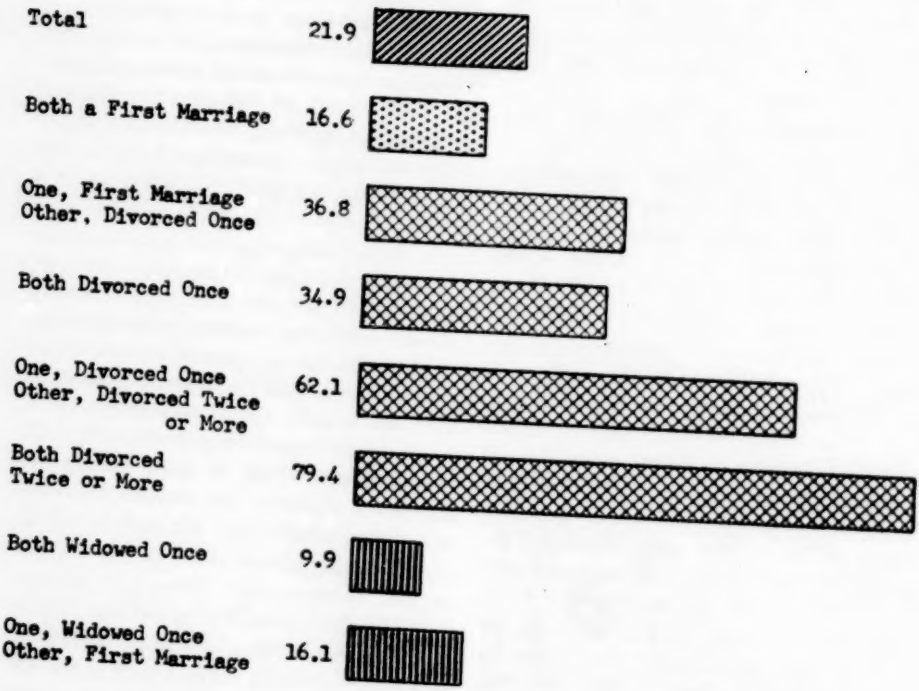
Ratio of Divorces per 100 Marriages by Marital Type. The overall ratio of divorces per 100 marriages in the 3-year period was 21.9. Since this figure is only slightly higher than that obtained by duration-specific calculations, the ratios shown in the chart and in Table 5 might be similarly considered, that is, as *approximating* the likelihood for each of the combinations of marriages ending in divorce (per 100 marriages).

Primary marriages (a first marriage for both parties) show a ratio of only 16.6 divorces per 100 marriages in that category, but where both parties had been divorced *once* before the figure doubles to 34.9, and where both parties had been divorced *twice or more* times before the ratio climbs to 79.4. Not all marital combinations are shown in the chart; some have too few cases per cell. One of the ratios obtained (a first-married bride with a twice-or-more divorced husband) appears extremely high. In this regard it must be remembered that marital types which are relatively infrequent may not be accurately gauged in this 3-year compilation; and also, in view of the nature of the information and the method, the ratios can only be accepted as approximate. A certain variability appears in the set of figures, but one must hesitate about drawing any inference from them regarding any unequal fragility on the male or female sides which have a similar prior marital history. Allowances for a later age at marriage for divorcees as compared to first marriages (and mortality reduction before divorce could occur) would only accentuate the divorce ratios found. The duration of these remarriages before divorce takes place a second time is shorter than for the first marriages, and this would tend to exaggerate their "rate" of failure. Nevertheless, everything considered, the differences in the "divorce ratios" obtained need not be disqualified to any appreciable extent on these scores.

As to the widowed, they show abnormally low ratios: 9.9 for the both widowed *once* only, and 2.0 for the both widowed *twice or more* only. One very important element, which it is not yet possible to eliminate from the results for the widowed classes, is their much older age at remarriage. In a group of 14 reporting states in 1954, divorced grooms (last or prior status) remarried at about age 36, whereas widowed males remarried at age 57—and brides of corresponding classes about 5 and 9 years earlier, respectively.[23] The low divorce ratios of the widowed may be due largely to the effect of joint-mortality, such that previously *widowed* couples do not survive as a unit to endure the rigors of divorce or make it necessary. The divorce ratio of first-married with widowed spouses bears out this surmise of age bias, as witnessed by the ratios of 15.1 for the widower with a first-married wife, and 16.8 for the widow with a first married husband.

[23] Supra, *Vital Statistics—Special Reports*, Vol. 44, No. 6, p. 108.

Ratio of Divorces
per 100 Marriages of
Selected Type of Marital Background *
Iowa, 1953-1955



* Divorced-widowed combinations excluded.

TABLE 5

RATIO
DIVORCES PER 100 MARRIAGES† IN IOWA, 1953-1955

Husband's Marital Status	Wife's Marital Status							
			Divorced Only		Div. and Widowed		Widowed Only	
	Total	First Marriage	Once	Twice or More	Once Divorced	Twice or More	Once	Twice or More
Total	21.9	18.3	36.6	63.8	36.7	56.9	15.5	12.1
First Marriage	18.4	16.6	37.2	76.4	49.0	*	16.8	*
Divorced Only								
Once	35.3	36.4	34.9	56.1	35.9	*	18.2	*
Twice or More	72.9	96.6	68.9	79.4	(59.8)	*	49.0	*
Divorced and Widowed								
Once Divorced	32.7	(32.8)	45.5	(36.2)	(35.6)	*	18.3	*
Twice or More	(75.0)	*	*	*	*	*	*	*
Widowed Only								
Once	14.8	15.1	19.0	42.3	16.9	*	9.9	8.2
Twice or more	9.6	*	*	*	*	*	4.8	(2.0)

†Annulments were included in marriage distribution and counted as divorces. Divorces do not include annulments, but annulments appearing in the divorce history of divorcees were counted as divorces. Only 1.0 per cent of the decrees are annulments in Iowa.

*Cells with less than 50 marriages. Figures in parentheses are based on 50-99 cases of marriages.

CONCLUSION

Marriages which are successful must certainly survive the social storms of life. Those which do not can hardly be called a "success." One author in this field, who compared a divorced and a happily married group in great detail, based his thesis squarely on the point that "divorce is a criterion of marital adjustment."[24] However, he and others have produced results which purport to show that remarried divorcees "on the whole are happy and adjusted in second marriages,"[25] and a new school of thought seems to be developing around this belief. Whatever the reason for it, there is a fundamental contradiction between the two viewpoints: that remarriages of the divorced are more likely to end in divorce *and* that divorced persons are as successful in their remarriages as once-married persons.

For the first time in the United States we have been able to gather data on a broad basis to show the incidence of divorce among remarrying classes. According to this information for one state, Iowa, as for marriage survival alone, it seems that the widowed who remarry fare as well as do the *primary* marriages, after making considerable allowance for the differential mortality effects upon the widowed group. With the divorced it is the opposite story: a divorce for one party weakens the strength of the marriage bond, and a second divorce experience greatly lessens the chances of survival of the marriage. It may well be that the twice-divorced, who are sometimes referred to as the "neurotics,"[26] have only about 20 to 25 chances in 100 for a lasting marriage.

Such are the hard demographic facts for the general population of Iowa, at least. Incidental information from a few other cities confirms this finding. The qualifications to the Iowa data given above should not be overlooked, however; and similar

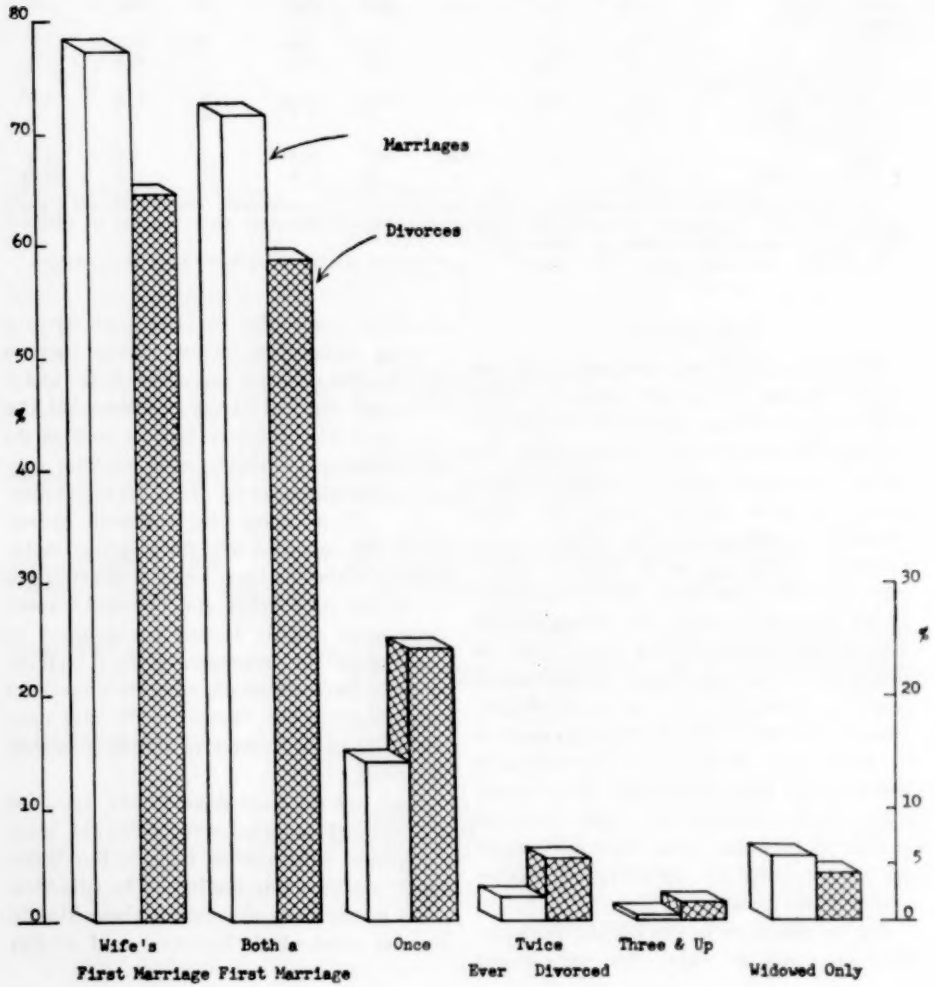
[24] H. J. Locke, *Predicting Adjustment in Marriage* (New York: Henry Holt, 1951), p. 3.

[25] See feature article on the Goode study (*supra*) in *This Week* newspaper magazine, January 8, 1956, p. 8, which states, "Nine out of 10 divorcees who remarry claim that their second marriages are better." Cf., footnotes 14, 16, 18.

[26] Waller, *op cit.*, 1930, p. 140; Edmund Bergler, *Unhappy Marriage and Divorce* (New York: International Universities Press, 1947); Shirley Raines, "Personality Traits of Persons Who Divorced and Remarried," M.A. Thesis, University of Southern California, 1949, as reported in *Family Life* X (June, 1950), 1-2; Kingsley Davis in *op. cit.*, 1957, p. 111 (1947 edition, p. 467); and Loomis, *op cit.*, pp. 450-51.

Marital Background of Women

Each Type as a Per Cent of Total Marriages,
and of Total Divorces in Iowa, 1953-1955



studies should be made to test the general or special validity of these findings.

All this is not to deny that there are other elements to a truly happy marriage; and the fact of mere legal endurance is not enough. Some marriages are indeed an endless round of tensions and conflict, until "death do them part." On the other hand some divorced persons do achieve a successful remarriage, and perhaps for the 50 per cent or so which manage to survive there is a high level of happiness.

If we take into account the higher proportion of married persons in the population of late, the divorce rate in the United States has been noticeably receding since the all-time high (1946) of the post-war readjustment period. From the demographic point of view, however, it seems we have gradually arrived at a stage in our American divorce history when the eventuality anticipated by Willcox and the statistical warning voiced by him can no longer be ignored.[27] Our divorce rate is being compounded by the repetitiousness of divorce among a divorce-prone population group,[28] and there seems to exist in our American system a dual pattern of marriage, with "sequential polygamy" being the practice of a substantial minority of the population, entirely "within the law."[29] According to one well-known family sociologist, "We are, in effect, operating a type of trial marriage system."[30] A realization of these facts should arouse a host of theoretical speculations and perhaps some more extensive research on the subject of remarriage.

[27] Willcox, *op. cit.*, 1940, p. 350. Cf., Inter-Agency Committee, National Conference on Family Life, May 1948, *The American Family, A Factual Background* (Washington, D. C.: Government Printing Office, 1949), p. 21.

[28] If we assume that 18 per cent of all first marriages are divorced, following which 75 per cent remarry and one-third of these fail a second time, and 50 per cent of the twice-divorced remarry with two-thirds of these failing again, a rough calculation comparable to Willcox's (*op. cit.*, 1940, p. 350) would show the following: the initial rate of marriage failure being only 18 per 100 marriages, the crude overall rate because of repetitiousness of divorces would be 24 per 100 marriages.

[29] P. H. Landis, "Sequential Marriage," *Journal of Home Economics*, XLII (October, 1950), 625-28; Bernard, *op cit.*, p. 46; Ploscwe, *op. cit.*, p. 63; and E. E. Eubank, "Why Marriages Fail," *World Tomorrow*, X (June, 1927), 274.

[30] Report of an address by Reuben Hill to the National Conference on Social Welfare, *Philadelphia Evening Bulletin*, May 22, 1957.

BIOCHEMICAL STUDIES IN SCHIZOPHRENIA

A Review*

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IN VIEW OF THE FACT that genic elements apparently exert their effects through control of metabolism, biochemical genetics holds a key position in current research programs dealing with the etiology of schizophrenia. Experimental studies with various organisms have demonstrated that measurable biochemical differences may have genetic bases (62). The importance of genetic factors in the causation of schizophrenia seems reasonably well established (33), and various metabolic dysfunctions have been described which are somehow correlated with the given disordered behavior pattern.

The pioneer studies of Selye have demonstrated that subjection to stress may induce changes not only in the endocrine system but in the body's entire metabolism and tissue reactivity as well (55). Confirmation of this basic principle has come from a variety of investigations. For instance, direct correlations have been shown to exist between imposed psychological stress and adrenal function as measured by urinary steroid excretions (46). Also, fatiguing psychomotor activities, collegiate examinations, discrepancy between aspiration and achievement, and so forth, have demonstrable effects on the activity of the adrenal cortex and the excretion of 17-ketosteroids (10); and striking biochemical as well as psychological changes have been observed in response to changes in social status and interpersonal relationships (7).

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Other studies have revealed that diet, emotional stress, physical activity, temperature, humidity, air pressure, posture, and experimental changes in the circulatory concentrations of hormones and other substances cause quantitative alterations in the excretory products of both plasma and urine (34).

The problem of identification of a primary vulnerability factor in the etiology of schizophrenia has yet to be solved. The difficulties encountered in interpreting the cause-and-effect relations of observed correlations have been a bottleneck in the search for constitutional factors which transform a set of "causal" or precipitating phenomena in some individuals into a set of clinical symptoms (30).

An attempt will be made here to review some of the pertinent experimental data obtained in this work.

Metabolic and Hormonal Studies

The amino acids in general have been reported by Young *et al.* (69) to have relatively high excretion rates in schizophrenics, with the exception of histidine which occurs at a relatively low rate. The observed decrease in histidine excretion has been ascribed either to increased excretion of some of the diazonium-coupling compounds or to the disputed occurrence of elevated histamine blood levels (8, 59). In Horwitt's opinion (30), the tendency of schizophrenics to show peculiar metabolic end products in their biological fluids reflects emotionally induced changes in their

metabolism, since "one of the basic characteristics of the schizophrenic patient is his peculiar emotional reaction to his environment." Adrenergic stimulation is known to have a marked effect on the levels of amino acids in the biological fluids.

In investigations of the urinary diazonium-coupling compounds, quantitative as well as qualitative differences have been found between schizophrenics and nonschizophrenics (36, 37, 69). With the biosynthesis of aromatic compounds known to be limited in man, abnormal metabolites of this kind are assumed to be derived from such dietary aromatic amino acids as phenylalanine, tyrosine, and tryptophan. A decrease in the number and amount of excreted aromatic metabolites "toward the normal and near-normal range" occurs in schizophrenics if phenylalanine, tyrosine, and tryptophan are omitted from the diet (36). The day-to-day variation in aromatic excretion patterns is so considerable in all persons, however, that it would be hazardous to regard any particular pattern as typically schizophrenic. In fact, if there are differences between schizophrenics and nonschizophrenics, they may prove to be quantitative rather than qualitative in nature and will have to be considered within the total picture of aromatic excretion patterns.

While the blood magnesium concentration is said to be normal in schizophrenic patients (5), their urinary magnesium content may be elevated under certain circumstances, possibly because of deficiencies in utilizing magnesium (69). It is conceivable that depletion in magnesium plays a role in carbohydrate metabolism (perhaps by interfering with enzymatic activity in the carbohydrate cycle), and this may explain why disturbances in sugar tolerance have been reported to be more frequent in psychiatric patients than in normal controls (5, 16). The value of this finding is reduced by the fact that the observed difference may be the result of malnutrition to some extent.

Cyclic changes have also been seen in the urinary excretion of total nitrogen and 17-ketosteroids, apparently correlated with "changes in mental status" (18). According to Reiss and Stitch (47), there are differences in the relative excretions of some urinary 17-ketosteroids, although the total amount of 17-ketosteroids appears to be within the normal range.

The urinary outputs of 17-ketosteroids, androgen and estrogen of 29 schizophrenic males were compared by Hoskins and Pincus (31) with those of 23 normal men and 11 normal women. Despite considerable overlapping, the schizophrenic sample showed a "definite approach toward the feminine patterns although they remained more masculine than the normal women."

An enzymatic disturbance in the adrenalin cycle was assumed by Rinkel (50) to give rise to "one or more noxious metabolites which, among other factors, may well be operative in the development of psychosis." In line with this hypothesis, and partly because of structural similarities between the mescalin and adrenalin molecules, the teams of Hoffer and Osmond (28, 29, 42) thought the cause of disordered behavior patterns to be a toxic adrenalin metabolite. While these investigators observed marked psychological changes following the injection of adrenochrome (25-50 mg.), an oxidized derivative of adrenalin, Schwarz *et al.* (54) failed to confirm such effects.

Reiter's report of temporary improvements in three schizophrenic patients following exchange transfusions (48) was questioned by Pfeffer and Pescor (44) who also used blood from nonpsychotic donors in six patients (500-1000 ml. every other day over long periods), without noticing any clinical changes. On the other hand, mild schizophrenia-like symptoms were observed by Heath *et al.* (21) in nonpsychotic volunteers who had received a protein extract (taraxein) from the blood of schizophrenics. The same kind of extract from nonschizophrenics failed to produce similar responses in a control group.

Adrenochrome has an indole nucleus common to all other hallucinogens, includ-

ing lysergic acid diethylamide, mescaline, harmine, ibogaine, hashish—and, according to Hoffer *et al.* (27, 29), adrenochrome could be present in humans. In schizophrenia, it is assumed that there is an abnormal diversion of adrenalin into adrenochrome or adrenolutin or some related metabolite. This hypothesis is based on the following observations:

1. Adrenochrome and adrenolutin produce both psychological and cerebral disturbances;

2. Compared with the blood specimens of normal controls, those of schizophrenics show a significantly greater proportion of high toxicity ratings in serum toxicity tests on fibroblastic cultures;

3. Urine specimens from schizophrenics contain indoles which apparently are quantitatively and qualitatively different from those found in controls.

Other interesting theories are that noradrenalin is synthesized in nervous tissue since its precursors have been found in brain extract (63), and that there may be some antagonism between niacin and an adrenochrome-like toxin with an abnormal diversion of adrenalin into a toxic indole (29). While the given toxin is assumed to produce schizophrenic phenomena, a decrease in the secretion of adrenalin may have a beneficial effect on the course of the disease. This effect may be brought about in the following ways: (a) by removing the factors responsible for oversecretion; (b) by increasing the degree of adrenalin utilization; or (c) by blocking the conversion of nor-adrenalin to adrenalin. As nicotinic acid and its amide are methyl acceptors, any procedure that would flood the body with these nontoxic substances is expected to diminish the synthesis of adrenalin from nor-adrenalin.

On the other hand, if the basic schizophrenic disturbance is associated with an overproduction of acetylcholine, with an abnormal diversion of adrenalin into some toxic indole substance, then it is assumed by Hoffer *et al.* that a reduction in the supply of methyl groups through the administration of niacin would be therapeutic. In fact, it has been reported by these investigators that repeated administrations of acetylcholine esterase produced marked improvements in chronic catatonic patients. The proposed hypothesis is that with acetylcholine esterase being strongly inhibited by granine, tryptamine, adrenochrome, LSD, bufotinine, harmine, and ibogaine, and with increased acetylcholine concentrations leading to the manifestation of schizophrenic phenomena, a reduced acetylcholine concentration may be antidotal to schizophrenia, especially since nicotinic acid tends to counteract the effect of inhibitors of acetylcholine esterase.

According to the observations of Hoffer *et al.*, nicotinic acid (niacin) administered intravenously reverses LSD psychoses as well as "many schizophrenic illnesses." Known to accelerate the conversion of LSD to 2-oxy-LSD (which lacks the hallucinogenic properties of LSD) *in vitro*, it may also stimulate the liver's ability *in vivo* to "detoxify schizophrenic toxins." Through the release of acetylcholine, cell surface resistance to the transfer of electrolytes may be decreased to a point where an excess of DPN-ase would be able to permeate the cell membranes and interfere with the intracellular respiration. Nicotinamide is an effective inhibitor of DPN-ase, while nicotine liberates sympathin by acting on the sympathetic chains (17). In schizophrenia, overactivity in both branches of the autonomic nervous system may result from an overproduction of both acetylcholine and epinephrine (27).

Pfeiffer *et al.* (45) believe that certain types of schizophrenics have an underlying deficiency of acetylcholine, and they report apparent improvement in some schizophrenic patients who were given DMAE (2-dimethylaminoethanol), an oral, synthesized acetylcholine precursor. Biochemical adjuvants which "apparently increase the effectiveness of DMAE are pyridoxine, vita-

min B-12, and possibly pantothenic acid."

Akerfeldt's (4) test data have also been interpreted in the sense that chemical aberrations may be correlated with schizophrenia, perhaps etiologically. This test, which is nonspecific and of limited diagnostic applicability, determines spectrometrically the rate of oxidation of 1.5 ml. of a 0.1 per cent solution of DPP (N,N-dimethyl-p-phenylenediamine) by an equal volume of centrifuged blood serum. The result is scored as negative unless the DPP is oxidized within six minutes. Many positive reactions were seen by Akerfeldt in schizophrenic and manic-depressive patients as well as in senile dementia, pregnancy, hepatitis, and severe rheumatoid arthritis.

Similar results were reported by Abood who used a comparable test (p-phenylenediamine). Reactions were positive in over one-half of pregnant women and schizophrenics, and in more than one-fourth of tested mental defectives and cancer patients, but in only three per cent of normal control subjects (3).

Another interesting finding in Akerfeldt's work (4) has been that the serological capacity of normal persons for oxidizing DPP is increased by aeration, prolonged exposure to room air, and dialysis against 0.9 per cent NaCl, thus approaching the rate characteristic of the serums of his schizophrenic subjects. Being heat labile and dialyzable, the DPP-oxidizing substance may be a catalytically active protein. Differences in the DPP-oxidation reaction are probably due to several factors. One of them is the enzymatic effect of ceruloplasmin, which usually contains more than 90 per cent of the serum copper and abounds in the blood serum of schizophrenics. Another is ascorbic acid, a reducing agent that tends to occur in subnormal amounts in schizophrenics.

With ceruloplasmin oxidizing such natural substrates as adrenalin and ascorbic acid, as well as synthetic substrates like DPP, the ceruloplasmin level may be increased in response to many different types of stress. Apart from pregnant, tonsillectomized or schizophrenic persons, increased serum copper levels have been found in various anemias, malignant tumors and neurological disorders as well as in rheumatic fever, rheumatoid arthritis, infectious hepatitis, Laennec's cirrhosis, hyperthyroidism, and myocardial infarction (20, 56). Obviously, therefore, since the concentration of ceruloplasmin fails to distinguish schizophrenics from nonschizophrenics in a definitive manner, neither the Akerfeldt nor the Abood test can at present be considered to be more than a vague diagnostic guide (56).

Synthesis and Action of Serotonin

With serotonin being assumed to play an important role in the functioning of the autonomic and central nervous systems, pharmacological interference with its action is found to have a drastic effect on neurogenic behavior (64, 66). The compound is also the vasoconstrictor which is released by the blood platelets into the serum during the clotting process, and occurs in such other parts of the body as spleen and visceral ganglia. In the brain, there are relatively large amounts in the older portions (i.e., midbrain and hypothalamus), while the cerebral cortex and cerebellum contain very little (22, 58). According to Woolley and Shaw and other investigators (12), stimulation of some peripheral nerves as well as administration of reserpine tends to liberate serotonin from the brain and other tissues.

Although both serotonin and nicotinic acid are apparently derived from tryptophan, their synthesizing pathways differ. The disposal of serotonin takes place through deamination, the product of which is found in normal urine (i.e., 5-hydroxyindoleacetic acid). Amine oxidase, which metabolizes the sympathomimetic amines, also metabolizes serotinin. In large concentrations, substrates of amine oxidase tend to interfere with the disposition of other substrates by competitive action, while excessive amounts of serotonin may tie up amine oxi-

dase and force adrenalin metabolism through another pathway (28). The enzymes catalyzing the synthesis of serotonin (i.e., 5-hydroxytrptophan decarboxylase) as well as its destruction (i.e., monamine oxidase) have been found in all animals in which the substance itself occurs (64).

The actions of serotonin include smooth muscle stimulation of blood vessels, gastrointestinal tract, and bronchi. Among antagonistic drugs (67, 68) are the ergot alkaloids (lysergic acid diethylamide) and the harmala alkaloids (including harmine and yohimbine). According to experiments on rat uterus (23), LSD and mescaline are synergistic with serotonin, while such tranquilizers as chlorpromazine, Frenquel and reserpine have an antagonizing effect. Another anti-serotonin substance is 1-hydrazinophthalazine which may produce symptoms of mental disturbance, thus supporting the hypothesis that mental changes of this kind are due to interference with the serotonin effect on the brain. It has been hypothesized by Woolley and Shaw (67), therefore, that the schizophrenia-like symptoms provoked by LSD result from an induced serotonin deficiency in the brain.

Apparently, mental changes are not precipitated by every antagonist of serotonin, and some serotonin fails likewise to reach the brain when administered peripherally. Hence, Woolley (65) has searched for serotonin-like compounds capable of penetrating into the brain without much difficulty, and for appropriate means of enhancing the ability of serotonin to overcome the blood-brain barrier. A step in the right direction may have been made by the combined use of an antimetabolite (the benzyl analogue of serotonin) and a precursor of serotonin (5-hydroxytryptophan). While the latter substance is said to increase the serotonin content peripherally as well as in the brain, the antimetabolite counteracts the peripheral effects without readily entering the brain. In this manner, it may have been possible in a number of schizophrenic patients to correct the original "serotonin deficiency." However, the reported data are still preliminary, and various questions regarding this theory have been raised by Rothlin, Cerletti, and Abramson *et al.* (1, 13, 51).

In line with a more recent report by Shaw and Woolley (57), it has been shown by Himwich (22) that LSD can also act to increase the effects of serotonin. According to Himwich, it is not possible at this time to conclude whether mental disturbances result from an excess or from a deficiency of serotonin. In fact, both theories may be correct, "but each may apply to different kinds of abnormalities."

Pharmacological Hallucinogens and Tranquilizers

In normal persons, transient mental disturbances resembling the symptoms of schizophrenia can be induced by various aromatic compounds. It is also well-known that one of the hallucinogens, LSD-25, antagonizes the effect of tranquilizing agents. This fact has led to the theory that schizophrenia may be associated with a metabolic error resulting in the biosynthesis of a similar hallucinogen (14, 49, 58).

Since an activated aromatic ring seems to characterize the structure of both hallucinogens and tranquilizers (26), it has been assumed that "natural" hallucinogens may fall into the same category of aromatic compounds. The observed differences between the excretory patterns of schizophrenics and non-schizophrenics are compatible with this assumption.

According to Rothlin and Cerletti (51), there is a quantitative difference between the effects of LSD and other hallucinogens. While an effective oral dose of LSD in normal subjects is between 0.5 and 1.0 gamma per kilogram body weight, "other hallucinogens, such as mescaline, require doses 5,000 times greater, and more, to produce psychic effects."

For various reasons, the use of LSD for producing a model psychosis has not been uncriticizable. Some investigators believe

that its effects do not differ materially from those produced by such "toxic" agents as alcohol, opiates, cannabis or cocaine. This belief is at variance with the terminology proposed by Osmond (41). In his opinion, "psychotomimetic" drugs are definable as "substances that produce changes in thought, perception, mood . . . without causing either major disturbances of the autonomic nervous system or addictive craving," and should be distinguished from other agents.

The absorption, distribution and excretion of LSD have been studied by tracing radioactive elements after the intravenous injection of LSD tagged with C_{14} radioactive carbon (51). While the observed distributions were normal in the liver and kidneys, two of the major routes of elimination, as well as in other organs such as spleen and adrenals, a relatively low concentration was found in the brain (11). The highest tissue concentration was reached in ten minutes and then declined rapidly. Final LSD excretion took place through the liver and bile into the intestinal tract from which it was completely eliminated (51).

Compared with the intramuscular route of administration, the onset of symptoms is less rapid when LSD is given orally, and more rapid when it is given intravenously. "Instantaneous" action on the nervous system is achieved by intraspinal application (24). Known counteractive agents include sodium amytal, pervitin, metemphetamine, chlorpromazine, and Frenquel (14, 15, 23).

Demonstrable responses to hallucinogenic and tranquilizing drugs may vary from one individual to another, and in the same individual at different times. For instance, a certain amount of LSD may induce psychotic phenomena in some persons and not in others, or in one and the same subject on some occasions and not on others. The reaction is often intensified by lack of food, sleeplessness, and emotional tension (53).

Since both "basic personality structure" and external stress factors seem to be important variables in LSD responses, it is assumed that the reaction is shaped by such experimental circumstances as are related to different metabolic organizations of the persons tested. The relation between specific metabolic and personality variations has yet to be clarified. The effects of the various chemicals blocking mescaline and LSD responses seem to be nonspecific (43).

MLD-41 (1-methyl lysergic acid diethylamide) which produces essentially the same reaction as LSD-25, except for higher reaction thresholds, has been used for developing tolerance to LSD-25 in Siamese fighting fish (2). This observation might seem to indicate that the administration of comparatively nontoxic substances (MLD-41 being less toxic than LSD-25) may suffice to raise a schizophrenic's tolerance to such "endotoxins" as may be at the root of his metabolic disorder.

There is still much uncertainty regarding the manner in which the different hallucinogenic and antihallucinogenic agents produce their chemical end results. Apparently, the action of a hallucinogen-antagonist may be either specific (acting directly on the hallucinogen) or nonspecific (altering the psychological effect of the hallucinogen without acting as a biological competitor).

Liver Function Tests

Using bromsulfalein and other dyes, investigations have been made of the possible role played by abnormal liver function in the etiology of schizophrenia. In the bromsulfalein test, the dye is injected intravenously and remains in the blood stream until its gradual removal by parenchymal liver cells. Excreted into the bile, it is eliminated in the feces (19).

Except for Wachsmuth's report (61) which presented evidence of abnormal liver function in 80 per cent of 203 schizophrenics and in 53 per cent of 41 mental defectives, it has been generally indicated by liver function studies based on the ability to excrete bromsulfalein or other dyes, that the responses of schizophrenics are "normal or

occasionally retarded" (5). Although a possible relation between defective liver function and schizophrenia cannot be precluded at this time, it is not substantiated by available data.

Even if there were a clearly established correlation between the two variables involved, it would by no means be certain whether liver dysfunction increases susceptibility to schizophrenia or is a concomitant of the schizophrenic process (30). According to Altschule (5), the symptomatology of hepatic insufficiency in psychotic patients may be a result of nutritional deficiencies and, therefore, may not be pertinent to the etiology of schizophrenia.

Reticulo-Endothelial System

The reticulo-endothelial system is formed by the reticular cells of the spleen, lymph, and hemolymph glands, the Kupffer cells of the liver, the reticulo-endothelium of the bone marrow, and the clasmatocytes. Impairment in the reactive ability of this system "may be the biological basis of the heredito-constitutional inferiority" leading to a lack of resistance to schizophrenic phenomena (32). This hypothesis was formulated when significantly increased tuberculosis fatality rates were found in schizophrenic patients as well as in their nonschizophrenic children and sibs (33).

Meyer's test data (pigment elimination tests, particularly with congo red, and Kauffmann's method) gave rise to the theory of a constitutional reticulo-endothelial system inadequacy in schizophrenics, resulting in a specific type of vulnerability to toxic metabolites (38, 39, 40). Hence it has been proposed to focus therapeutic measures in schizophrenia on improving the organism's disordered defense mechanisms based on the activity of the reticulo-endothelial system.

In the pigment elimination test, intravenous injection of 10.0 c.c. of a one per cent water solution of congo red is followed by measuring photometrically the pigment concentration of the serum after (a) five and (b) 60 minutes. The relation between the two measures constitutes the congo red index. Normally lying between 50 and 70, the index may reach 100 under conditions indicative of a severe dysfunction of the reticulo-endothelial system. Of course, many other variables may be expressed by the given test results, especially the functions of liver and kidneys.

In the Kauffmann test (cantharidin blister test), cantharidin patches are placed on the skin to induce the formation of a blister, the contents of which are examined quantitatively as well as qualitatively (35). Determinations are made of the amount of exudate, the total exudate cell count, and especially the number of so-called histiocyte cell elements. A relatively high percentage of lymphohistiocytes is supposed to be indicative of schizophrenic illness, while a low percentage is said to be inconclusive. Meyer's data also indicate a positive correlation between the congo red index and the percentage of lymphohistiocytes (38).

Conclusions

Although many metabolic differences between schizophrenics and nonschizoprenics have been described, it is justified to conclude that the biochemical basis of schizophrenic psychoses is still unclear. Essentially, the reported differences have been quantitative in nature and do not seem to be specific. The absence of strict dietary and other controls makes questionable the value of much of the reported data.

There is some evidence for the involvement of the adrenalin cycle in the production of toxic compounds capable of inducing psychotic phenomena. It seems, however, that the primary biochemical deficiency distinguishing the metabolism of schizophrenics from that of normal controls has yet to be identified (6). Complicating factors in this work are the concomitants of prolonged hospitalization in deteriorated patients (malnutrition, infections, and so forth).

The theory ascribing schizophrenia to a

cerebral serotonin deficiency is supported by the observation of psychotic symptoms in response to the effects of antimetabolites of serotonin. According to preliminary and unconfirmed data, an increased cerebral supply of serotonin may tend to suppress the disease in some patients. Other data support the theory that mental disurbances may result from an excess of serotonin.

There are certain indications that functional inadequacies of the liver or of cellular elements of the reticulo-endothelial system may play a role in the etiology and clinical course of schizophrena, possibly by reducing the elimination of toxic metabolites. While some observed correlations seem promising and provocative, the interpretations of the given cause-and-effect relationships are largely speculative at this point.

On the whole, it is stated with regret at this point that available data are either disputed or in need of further corroboration.

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GENETIC AND CULTURAL CHARACTERISTICS*

A Sociologist and a Geneticist Examine Major Issues

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This collection of papers, which comprised one Round Table of the 1956 Annual Conference of the Milbank Memorial Fund, ranges over a wide territory embracing, as the title suggests, both the biological and the purely social or cultural components of human behavior. This was the first such Milbank Round Table in nineteen years; the rationale for this excursion, somewhat outside the usual realms of these conferences, was the progress made in the field of genetics during that period. It is, perhaps, inevitable that a conference consisting of disjunct papers should be more a mosaic than a unity and should only partially reflect the progress of the field. Nevertheless, this collection of papers does represent an attempt not merely to communicate across disciplinary lines but to bring a variety of skills to bear upon the analysis of "human characteristics." For this reason, and in the hope that a critical commentary examining some major issues of the field might be of interest, a rather lengthy, cross-disciplinary review seems in order.

The papers fall into three groups. The first of these groups provides a general orientation to "Factors Influencing the Characteristics of Populations": Th. Dobzhansky on the biological concept of heredity as applied to man, H. L. Shapiro on the impact of culture on genetic mechanisms, and R. B. Vance on the transmission of the social heritage. Dobzhansky's paper serves not only as an introduction to the biological concept of heredity but develops broad principles for studying the interaction of genotypes and environments. "Characters," he points out, "are no more than aspects of a single process of living, and the life of an individual is brought about, jointly and severally, by all the genes which the organism has." The demonstration that a given trait is conditioned by heredity does not in the least exclude the possibility that the variation in this trait is controlled also by environmental influences. Dobzhansky points out that even such supposedly genetically predetermined characteristics as skin color are partly modifiable, and that such completely "learned" attributes as speaking a language presuppose a human "genotype," and not all human genotypes are equipotential in this respect. He emphasizes that, even in these extreme examples, the phenotype is the product of a nature-nurture interaction and "necessarily depends upon both interacting variables." Relations between genotype and phenotype are discussed in the light of known mechanisms of gene action. Finally, culture, as an emergent human aspect of environment, is discussed and related to both heredity and the physical environment in a triangular interacting system in which the task of examining interactions entails going beyond the simple dichotomy of heredity and environment. "The genetically established

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capacity to absorb, transmit, modify and create the body of learned tradition known as culture sets our species apart from all biological species." Culture is, of course, a part of the social environment, but it is itself a heritage whereby acquired characteristics are transmitted (learned) from generation to generation. Thus the interaction of three sets of variables must be considered in attempting to understand the distribution of many human characters.

Unfortunately, Dobzhansky's challenging formulation is not developed by the other members of the symposium, and one feels that while most of the authors of the other papers would accept his formulation, they do not always keep it in mind. It seems a pity that the excellent presentation of as fundamental a problem as this one is independently rehashed by succeeding papers. When the "nature-nurture" theme appears in these, it is an ancillary topic, necessarily foreshortened and truncated. Of the ensuing discussions, some are apt (e.g. Falkner, paragraph 3, p. 122) and others would have benefited from a clearer understanding of Dobzhansky's analysis.

In the second article, H. L. Shapiro turns to cultural characteristics and relates these to genetic mechanisms both as product and modifier. As product, culture is seen as a recent outgrowth of evolution, dating back approximately a million years. As modifier, it makes adaptive demands upon man and becomes a vectorial factor in natural selection. Shapiro's comments on "the decisive influence of culture in shaping man as he now is" are thoughtful but very general.

Vance acknowledges that we need to study the interaction of biological and cultural heritage but turns all his attention to a description of the process of how we transmit "the essential humanity, the civilization, the social traditions that we have inherited from the collective past." He describes how the customs of the group become the habits of the individual and how the persistence of the group makes bureaucracies tenacious and maintains organizations of all sorts. On the whole, Vance seems to believe in the exchangeability of man for man within various positions in the social structure. Motivation and intelligence are seen as "the bridge between humanity's varied social heritage and the achievement of this inheritance by diverse social groups." Intelligence, the most significant component of man's genetic heritage, is, indeed, the only one specifically brought into the picture as representative of the underlying genetic substratum upon which human cultural evolution depends.

As a whole, the first group of papers deals with the *transmission* of characteristics but not with the nature of these characteristics except in the most general sense. Vance lists a brief inventory of types of social heritage, but by and large characteristics, or "traits," are simply mentioned illustratively in these papers: skin color, language, disease, intelligence, personality. Perhaps no systematic classification of the types of human characteristics is today within reach, but surely there exist some partial conceptualizations of the realms within which human responses may be characterized! Of greatest interest, of course, would be precisely those characteristics which mediate between the two types of heritage. Are there, for example, different genetic structures underlying differentials in ability to relate to other persons, differences in reaction time, energy level, frustration tolerance? The culture is transmitted primarily within the family through relationships that are charged with emotion and almost certainly influenced by the types of factors just mentioned.

The problem of defining *types* of characteristics again emerges in the next group of papers which deal with the identification and distribution of variant characteristics. The characteristics discussed are personality and intelligence tests, social schedules, medical and psychiatric histories, and inclusion in the 1956-57 edition of *Who's Who in America.*

W. R. Thompson notes in the first paper that a basic issue in the development of psychological tests is "the taxonomic problem of choosing and specifying dimensions of description at the psychological level that have some real biological significance." But this is not a topic with which he deals adequately. After a discussion of the difficulties in trying to achieve a truly "culture free" assessment of intelligence or personality, and a brief consideration of the promises and difficulties inherent in the use of factor analysis, he seems to come to the conclusion that in the state of present knowledge it is not possible to suggest how the problem can properly be tackled. We are left, then, with the picture that present tests permit us to "describe the individual minutely" but may be of little or no value for research on the interaction of genetic and environmental factors.

The next two papers are illustrative of modern social science survey techniques seeking to establish the prevalence and social psychological correlates of mental retardation and psychiatric symptomatology. A study of mental retardation, by Jastak and Whiteman, entailed a screening interview with a random sample of the adult population in Delaware, followed up by an intensive interview of a subsample. Using four criteria of mental retardation—I.Q., "altitude" (highest subtest score), schooling achievement, and occupational achievement — these workers obtain findings that call into question the use of I.Q. alone as a means of identifying persons as mentally deficient. Of the lowest 25 per hundred screened out by I.Q. alone, 20 would not be screened out as being in the lowest quartile of the other three distributions. They conclude that mental subnormality need not connote an inability to fill an acceptable social role, since the adjustments of the "retarded" group to environmental demands are alleged to be good. These include job adjustments, marital adjustments and lack of legal offenses. If one may extrapolate from the results, selection does not seem to be discriminating significantly against persons judged to be mentally retarded by the Jastak-Whiteman criteria. The same generalization would appear to hold with respect to the high incidence of psychiatric disorder reported in the paper by Dorothea Leighton. This is a preliminary report of the prevalence and socio-cultural correlates of persons with symptoms of psychiatric significance in a small town in eastern Canada. The study used case-finding, interview of a random sample of the population, psychiatric ratings of the interview materials as a basis for assessing symptom patterns, the apparent psychiatric significance of reported or revealed symptoms, and the degree of impairment by virtue of psychiatrically significant symptoms. A minimum of thirty-seven per cent of the population were felt to be more than ten per cent impaired by virtue of psychiatric symptomotology, and the bulk of the population was characterized as having suffered at one time or another from psychophysiological or psychoneurotic difficulties. In the reports of the studies of mental retardation and of psychiatric symptomotology, no mention is made of the fertility of the various categories, nor does it appear that either study attempted to ascertain the genetic contributions to the conditions studied. Both papers, in fact, use as criteria of the characteristics being assessed, ratings that are in large measure relative to the distribution of those characteristics in the particular populations studied. These studies illustrate how crude our measures are and how uncertain we are in attempting to draw the line between sick and well in the realm of psychiatric disorder.

Kirk's study of the fertility of a gifted group (men in *Who's Who in America*) bears more directly upon the transmission of population characteristics. He concludes that in contrast to the situation prevailing in the past, "if present trends continue the genetic qualities of men in *Who's Who in America* will be perpetuated at least in

their numerical proportion to the general population."

The final topic of the conference is entitled "Research on Genetic Factors in Characteristics of Populations." In the first paper, dealing with the pathways between genes and behavioral characteristics, J. L. Fuller discusses various approaches to the study of "relationships between heredity and behavior which are not conditional upon gene-induced gross defects of development and metabolism," drawing largely upon the results of research on animal behavior. In the succeeding paper on genetic aspects of mental disorder, Gordon Allen examines some "misunderstandings that obstruct communication between geneticists and others, especially in the realm of psychology." He observes that failure to demonstrate a biochemical or anatomical stigma in no way rules out the possibility that a behavioral trait has a genetic basis, and conversely, the findings of a correlated anatomical or chemical variation is in no way a demonstration that genes are determinants of the associated behavior. He notes the fallacious assumption that continuous variation and the frequency of mental disease argue against a genetic basis and discusses the possibility that genes responsible for producing illness in the homozygous state may be "paying their way" by conferring benefits in the heterozygous state. In discussing the design of research in this area, he suggests that the foremost task is the development of "biologically meaningful definitions and classifications." He proposes the development and use of a variety of sets of criteria for distinguishing schizophrenia, for example, subjecting the resulting materials to analysis by genetic methods.

Finally, a paper by Frank Falkner appraises the potential contribution of longitudinal twin studies. Successive measurements in the same individuals permit the study of growth increments and of change. Admittedly, longitudinal studies are far more difficult to carry out than cross-sectional assessments, and the recruitment of adequate samples of monozygous and dizygous twins would add greatly to the complexity of the research. Falkner calls attention to some of the problems to be faced but stresses the potential pay-off if such studies can be conducted comparably among diverse populations.

A SOCIOLOGIST'S VIEW

This sociologist, interested in personality development and especially in the interaction between the biological organism and the family environment, was gratified at the general agreement that the heredity-environment question should be phrased in terms of interaction. Because he had expected more controversy, his first reaction to this symposium was to feel that social scientists and geneticists had learned to work together in the study of human behavior. But further consideration suggests that to a large extent their research efforts tend to bypass each other. It is natural that most workers in the biological and the social sciences will be primarily concerned with the theoretical and methodological problems that lie at the core of their respective fields. As Vance suggested, workers in each field are willing to admit that the variables studied by the other *do* make a difference, but in their own work they tend to proceed by the method of "all other things being equal." Interaction between two sets of variables cannot, however, be studied on this basis.

It is instructive to note that the study of intelligence represents by far the most impressive area of collaboration — and of agreement — between biological and social scientists studying human characteristics. All are agreed that this is a most important characteristic influencing adaptation to one's environment, especially through the learning of the cultural heritage. Moreover, there is qualified agreement that despite cultural biases and other shortcomings of intelligence tests, the I.Q. is a reasonably stable and sufficiently valid measure of in-

telligence to use in studies of the interaction of genetic and social components within a relatively homogenous culture to which the test is appropriate. At least, no one purporting to study intelligence fails to ascertain I.Q.!

One gets little idea, from this collection of papers, what other characteristics are regarded as of general importance, except those which, in Fuller's words, are "conditional upon gene-induced gross defects of development or metabolism." The quest for constitutional types is mentioned by Fuller and by Falkner; both indicate that the substantial amount of effort devoted to this quest has thus far failed to provide useful behavioral characterizations of man. Falkner seems to hold some hope for finding a relationship between body build and temperament, but not on the assumption of completely static types.

We come back to the question then, what is it, in the individual make-up as given genetically (other than intelligence), that makes a difference in the way that the patterns of the culture are internalized, in the kinds of relationships that are formed with others, in the response of the infant to his parents, his world? Again and again in these papers, one is told that a major problem relates to finding psychological classifications which are biologically significant. The failure to find them is a reflection of the extent to which genetic mixture and cultural diversity so blend their effects in human interaction as to mask the resemblance of phenotypes. Many psychological treatises on personality development hypothesize that differences in temperament or in response to stress may be influenced by genes. But no measures of temperament or response to stress have achieved general acceptance, even as minimally adequate. A general review of the current status of psychological theory and testing in this area would be helpful. It is not enough to assume that factor analysis will turn up the relevant dimensions in time.

A consideration of the studies which deal with mental disease and mental deficiency suggests that even here alternative hypotheses are not used as the basis for setting up studies of interaction. Studies that attempt to assess genetic influences in schizophrenia or other personality disturbances seldom examine variables regarded by the psychodynamic psychiatrist as most significant; in turn, studies of the prevalence and sociocultural correlates of mental retardation and mental disorder tend to ignore the genetic dimension. In the present group of papers, for example, there is reference to the finding that individuals with O blood type are relatively more susceptible than those of other blood groups to peptic ulcer. The prevalence of peptic ulcer seems also to be related to parental authority in the family structure, to occupation and to characteristic ways of handling aggression. But rather than being viewed as a challenging problem for research, the finding is noted and dropped because "neither the genetic nor the psychological hypotheses are strong enough by themselves to support any additional theoretical edifice." There may be insurmountable difficulties in the way of such research, but it is not clear that such is the case. To this reviewer it simply does not make sense to avoid cooperative cross-disciplinary study in those areas where geneticists and behavioral scientists have competing hypotheses and then to seek other variables for which no hypotheses yet exist.

What many of the papers seem to be saying is that we have a long way to go and that neither routes nor vehicles now available are adequate to get us where we want to go. Better measures of personality variables are needed—on this there is general agreement—and this reviewer would argue for trying to delineate some of the relatively enduring aspects of personality which can be reliably assessed in childhood by a variety of techniques. Despite the great progress in some areas of psychology, this particular area has not been systematically approached from the perspective needed to serve research on the interaction of genetic

and socio-cultural factors. Falkner's paper does suggest that this situation is now being remedied, but the process will take time.

The studies of mental retardation and psychiatric symptoms reported in this collection make no attempt to achieve classifications that are biologically significant. Indeed, it would be difficult to find classifications more designed to obscure the study of genetic components. These tend to be conglomerations of behaviors which bear similar social stimulus values but result from a great variety of circumstances. For social planning purposes such classifications may be useful, and neither study purports to go beyond the search for socio-cultural correlates. But the reader interested in examining interrelationships between genetic and socio-cultural factors gets little help from these studies. The Jastak-Whiteman paper, for example, reports the use of a multiple criterion of retardation which looks reasonable at first glance but entails several dubious assumptions. For example, school achievement (indexed by the number of completed grades of school divided by the average number completed by one's age group) can only be taken as an index of retardation if under-achievement is primarily a reflection of inability to do well in school. Even in this case, under-achievement is, of course, a result of the interplay of genes and cultural factors. But to classify all persons in any age group retarded if they fail to complete N grades of school, when the cultural norm for their socio-economic and ethnic group may have been less than N grades, does violence to this sociologist's concept of mental retardation. Small wonder that there is only a modest intercorrelation between the several criteria when one uses them jointly for screening purposes. I.Q. alone is an inadequate basis for diagnosing retardation, but the multiple criterion proposed may be more useful as the basis for analytic cross-tabulations than as a means of identifying mentally retarded persons.

As Gordon Allen points out in his paper, progress in clarifying the influence of heredity upon mental deficiency has come about in part through ability to discriminate among similar diseases with better diagnostic methods, psychological as well as physical and chemical. The classification of persons according to degree of impairment by psychiatrically-significant symptoms, as is done in the Leighton paper, clearly makes no effort at etiologically relevant discrimination. Nor does the lumping of "psychoses" or "psychophysiologic symptom patterns." One is left, then, with interesting data on the reported occurrence of symptoms over a lifetime, but with little hope of discovering sub-groups which differ significantly in the relative contributions of heredity and life experience.

Perhaps the tone of the above observations is too critical. The contributors to this Round Table prepared their separate papers without apparent coordination and could hardly be expected to bring their several specialties to bear upon the issues so clearly stated by Dobzhansky. A reviewer cannot help but wonder how much further, in the light of present knowledge, a more coordinated examination of the issues, the concepts and the methods of research in this field might have gone. It is to be hoped that before another two decades have passed, another Round Table can bring reports of research which examines more closely the selective interplay of genetic and socio-cultural factors in human populations.

A GENETICIST'S VIEW

So far as topic I is concerned, from the point of view of the cultural bias of a geneticist, more evidence for the views advanced by Shapiro and Vance with respect to the role of culture in human evolution would have been welcome. For Shapiro, the ability to use tools (thus modifying the natural environment) and the ability to communicate (thereby transmitting the cultural accretions to others) are the pri-

mary results of human evolution. Culture, in turn, becomes a selective factor, making "demands to which our population must adapt itself in the long run if it is to be maintained" The suggestion is made that cultural differences have already caused genetic differentiation among castes in India. But has culture really acted in this way? The reference to the specific instance in India is unsupported by bibliographic citations and thus not readily accessible to evaluation. The alleged demands of civilization would suggest that people of substandard intelligence and skills should have difficulty in competing in our society, if not in leaving progeny, yet, in this same symposium, the Jastak and Whiteman results argue that selection does not operate in any obviously adverse manner against such people in the state of Delaware. They also state that culture has not "interfered with genetic mechanisms or distorted them in any way." But what about the increase in high energy radiation that "culture" is adding to our environment and that must, in the long run, involve a mutagenic effect? Or, what about the possibility of directed mutation which seems to be a reasonable cultural expectation of the future? Or the effects of medical knowledge in preserving genetic defectives? Is it not possible to argue that as culture advances, selection pressure in general is decreased except in the most extreme cases, and that the major effect of our civilization is to preserve, rather than curtail or direct genetic variability, as would be the case if selective pressure were to increase in a given direction?

R. B. Vance, in pointing out that social organization can compensate for a dearth of talent, so that "we have government by clerks, rather than by geniuses," and "even the traits of the managerial elite can be analyzed in terms of acquired characteristics," adds credence to this view (*op. cit.*) as does J. L. Fuller in a later section. While a cataloguing of diverse opinions on this question is interesting, where are the facts on the basis of which one may test each view? What principles are to be invoked in determining which facts are critical?

Turning, now, to the second topic and beginning with the discussion of genetic requirements for the analysis of psychological traits, Thompson appears not to have been affected by the reasoning in Dobzhansky's introductory article. Thus (pp. 46-47) Thompson writes, "If we are concerned with effecting a *separation between hereditary and environmental causes* of personality, we must *first* be able to provide a *parsimonious* description of personality at the phenotypic level. In classical genetics this has not been a major difficulty, since the characters chosen for study have usually been of an all-or-none variety, such as flower color or pod shape. With psychological traits which are continuous, the problem is a very real one indeed."[1]

In the first place, we are *not* concerned with effecting a separation between environment and heredity. We know that they interact. In our laboratory, for example, the effects of standardized early experience on the later aggressiveness of inbred strains of mice varies with the strain. A given type of experience *interacting* with a given genetic background produces an "aggressive personality." The interaction produces different results on different biological substrata, and the latter will interact with other environmental variables to produce results similar to that of the first interaction. Knowing these facts, one can produce a variety of interactions leading to similar end results. Nor, do we *first* describe a behavioral phenotype. To *discover* a behavioral phenotype that corresponds to a genetic-evolutionary unit in nature is more often the *result* of research. One cannot decide what it is going to be *a priori*. If one can discover a presumed phenotype and then find that it has a clear genetic basis, the further analysis of the mode of gene action may reveal that the initially

[1]Italics are those of the reviewer.

presumed phenotype was, in fact, only an obvious aspect of an aberration whose most important effects did not correspond to a standard test or piece of apparatus. Thus *genetics may be used as a tool to help discover natural units of behavior,* rather than the reverse. Finally, genetic analysis does not depend upon all-or-none traits as Thompson implies. Even Mendel, who is apparently alluded to in the reference to "classical genetics," concluded his paper with a model that extended his theory to continuous characters, and genetic analysis of continuous variations were being competently made by Edward Murray East as early as 1910.

In his statements about human population structure, Thompson argues a particular model based on assumptions that demarcations of social status, religion, and ethnic origin are, as a rule, observed in human marriage patterns within our culture. He offers only his own opinion of the extent to which this is so. If one uses paternity rather than marriage as a criterion, how high are the barriers? It could be argued *ad hoc,* that the barriers are crossed with significant frequency for genetic exchange. Where would Thompson set the criteria for significance? In this country, for example, do not Catholics, Jews, and Protestants of diverse old world origins intermarry commonly within religious boundaries, and, less commonly, across them? How rare is a Bobo Rockefeller? What, in fact, are the groups in our present society among which there is restricted genetic exchange and how much genetic exchange actually occurs between them? Conjecture without fact is useless here.

The remaining articles grouped under topic II, offer more grist for the sociological than for the genetic mill. Jastak and Whiteman define mental "retardation" in terms of multiple criteria used individually and aggregately against a population distribution in which the lower quartile is the demarcation point. This is hardly a conventional criterion of retardation but simply a relative ranking. Even granting their identification procedure, are they maintaining that mental retardation as defined by their study is genetically predisposed? If not, of what relevance is the paper to the symposium? If so, where are the genetic data, the differential fertility data, and the progeny studies?

The Leighton study, too, is predominantly sociological. Its genetic interest to this reviewer arises out of the suggestion made in the final section of the symposium (by Allen) that the symptoms dealt with may be of genetic origin.

The Kirk paper, which argues that, contrary to the trend of a generation ago, men listed in *Who's Who in America* today are replacing themselves at a rate that will preserve their numerical proportion to the general population, ends the section on a hopeful note.

In the final topic, dealing with genetic factors, the first paper by Fuller argues for an approach that relates the genotype to the phenotype without the delay and difficulty of dissecting the intervening modes of gene action. He states (p. 101) that "we identify an intelligent man by his actions, not by his body chemistry." This seems to me to be based on a rather bleak view of the complexities involved in physiological genetics and a misplaced confidence in the adequacy of our behavioral "phenotypes." This contrasts with Thompson, for example, who would consider the matter of defining an "intelligent" man by his actions to be rather more complex than Fuller does. In the latter's example (p. 104) concerning susceptibility to audiogenic seizures in mice, in which my work is cited, the seizures led to the elucidation of several underlying neurochemical abnormalities, each correlated with a particular genotype. The differential localization of enzymatic deficiencies in the brain on a genetic basis in turn led to hypotheses about learning behavior and stress behavior that are now proving valid in our laboratory, so that the elucidation of the total behavioral pheno-

type was *consequent* to the discovery of the intervening variables, and the spectrum of these as related to genotypes within a phenotype, in turn, provided a new and broader view of how it is that genes may act in the nervous system. This approach helps define natural evolutionary units of behavior. The mere correlation of heredity with a given aspect of personality has been going on for a long time and has not advanced us spectacularly in understanding genetic effects on behavior. It is difficult to see how an accumulation of more data in this field will provide us with the new and different insights that seem to be needed, except as a springboard for the kinds of studies just mentioned, which Fuller disavows.

Since this is the major difference between us, it is, perhaps magnified here. In the long run, such differences in point of view may lead to a complementarity which is required in order to give a well-rounded picture.

In comparison with the previous papers, Fuller takes the view that human populations are selected for diversity and that complex social organization is a factor in preserving and extending such diversity.

In view of the statements made by Vance (p. 34) to the effect that many genetic traits, such as pigmentation, bear no relation to the ability to acquire cultural traits, the data cited by Fuller concerning genotype and phenotype are of particular interest. He reports that "results indicate that many, if not all, gene substitutions have effects upon behavior which are not obviously related to the most conspicuous action of the gene. Thus, the yellow gene reduces the mating drive of male *Drosophila,* in addition to its effect upon body pigment." He further reports that humans with O blood type are more susceptible to peptic ulcer than those of other blood types. While Fuller is conservative in his interpretation of such findings, the assertion by Vance to the effect that physical traits bear no known relation to the ability to acquire cultural traits is not as completely open and shut as he makes it seem. If, in addition, as Shapiro states, cultural factors have indeed produced genetic differentiation (at least among castes in India), the notion that diverse human stocks are equipotential with respect to the acquisition of cultural traits requires demonstration.

Gordon Allen, in dealing with genetic aspects of mental disorder, points to the recency of the marvelous evolution of human mental capacities and, reasoning by analogy with other rapid and significant developments in evolution, where variability precedes stability, argues that the prevalence of human psychopathology (see also D. Leighton) may be a phenotypic manifestation of this genetic instability. This seems an intriguing and noteworthy hypothesis.

In the final paper, F. Falkner considers the potential contribution of longitudinal twin studies and discusses the role these could play in filling present gaps in our knowledge, especially by means of comparison between "monozygous and dizygous twins and their siblings . . . to elucidate the weightings of genetic and environmental influences."

One wonders, in this connection, whether monozygous twins are really genetically completely identical. If the potential genetic repertoire of an individual is broader than that which actually comes to expression, can it not be that, for humans, as for lower organisms, the narrowing of the genetic potential is in part determined by environmental differences, especially during critical periods of ontogeny? If so, Falkner's suggestion that discordant features in monozygous twins may be of singular importance is open to alternative interpretations depending on the notion of genetic-environmental interaction against which the reader balances the suggestion. The importance of the suggestion remains, whatever the range of mechanisms occurring to the reader may be.

Since this is a joint review by a geneticist

and a sociologist, each of us has reserved his major criticism for his own area of competence. The conference was certainly a stimulating one. If it was conjectural on many points, it is because clear-cut data on the basis of which one might settle the questions at issue do not exist. If the papers were not completely integrated, it is because they are, after all, the individual contributions of individual authors. Hopefully, continued preoccupation by social and biological scientists with the problems of behavior, and more cross-disciplinary communication between them, will provide the needed exchange of information and stimulate the type of research that will result in data that are needed to replace informed guesses with facts. Finally, the conference would have benefited from a report of the discussion of each paper among the conferees. It is regrettable that the published volume contains no such record of the exchange of ideas among the participants.

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CONSANGUINEOUS MARRIAGES IN BRAZIL*

I. Structure of Such Marriages

II. Factors of Geographic Distribution

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I

STRUCTURE OF CONSANGUINEOUS MARRIAGES

THE STRUCTURE OF A CONSANGUINEOUS MARRIAGE is here defined in terms of the sex of the individuals who occupy the line of relationship between husband and wife. Thus, each kind of consanguineous marriage can be subdivided into several classes, e.g., four in the unions between uncles/nieces + aunts/nephews and between first cousins, sixteen between first cousins once removed and between second cousins, etc. (*cf.* Orel, 1932; Haldane and Moshinsky, 1939; Ludwig, 1948, 1949; Macklin, 1952; Morton, 1955). In the present analysis, we shall deal only with the position of the spouses in the pedigree and with the sex of the parents through whom husband and wife are related. With this criterion, four basic classes can be distinguished in each kind of consanguineous marriage, as follows:

Uncle/niece + Aunt/nephew

A—The wife is the maternal aunt of the husband.

B—The wife is the paternal aunt of the husband.

C—The husband is the maternal uncle of the wife.

D—The husband is the paternal uncle of the wife.

First cousins

A—Both are children of two sisters.

B—The husband is the son of a paternal aunt of the wife.

C—The husband is the son of a maternal uncle of the wife.

D—Both are children of two brothers.

First cousins once removed

A—The husband is the son of an aunt of his wife's mother (or the wife is the daughter of an aunt of her husband's mother).

B—The husband is the son of an aunt of his wife's father (or the wife is the daughter of an uncle of her husband's mother).

C—The husband is the son of an uncle of his wife's mother (or the wife is the daughter of an aunt of her husband's father).

D—The husband is the son of an uncle of his wife's father (or the wife is the daughter of an uncle of her husband's father).

Second cousins

A—Both are the children of two first cousin females.

B—The husband's mother is the first cousin of the wife's father.

C—The husband's father is the first cousin of the wife's mother.

D—Both are children of two first cousin males.

For first cousins, first cousins once re-

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TABLE 1 FREQUENCIES OF THE FOUR BASIC TYPES OF COUSIN MARRIAGES IN TWO POPULATIONS

Population and time	First cousins							Parents			
	A	B	C	D	Total	χ^2	P	♀	♂	χ^2	P
S. Paulo, 1910	21	20	21	21	83	.036	> .99	83	83	—	—
S. Paulo, 1943	4	6	3	2	15		•• .53	17	13		•• .59
Total	25	26	24	23	98	.204	> .95	100	96	.082	> .70
Curitiba, 1951-'55	21	31	29	32	113	2.646	> .30	102	124	2.142	> .10
TOTAL	46	57	53	55	211	1.303	> .70	202	220	.768	> .30
	First cousins once removed										
S. Paulo, 1910	7	4	6	5	22	.909	> .80	24	20		•• .65
S. Paulo, 1943	2	1	0	2	5		•• .77	5	5	—	—
Total	9	5	6	7	27	1.296	> .70	29	25	.296	> .50
Curitiba, 1951-'55	4	11	10	15	40	6.200	> .10	29	51	6.050	> .01
TOTAL	13	16	16	22	67	2.552	> .30	58	76	2.418	> .10
	Second cousins										
S. Paulo, 1910	12	8	3	15	38	6.947•	> .05	35	41	.474	> .30
S. Paulo, 1943	2	2	0	0	4		•• .34	6	2		•• .29
Total	14	10	3	15	42	8.476	> .02	41	43	.048	> .80
Curitiba, 1951-'55	25	20	22	29	96	1.917	> .50	92	100	.333	> .50
TOTAL	39	30	25	44	138	6.406	> .05	133	143	.362	> .50
	Other degrees										
S. Paulo, 1910	1	8	6	4	19		•• .15	16	22		•• .42
Curitiba, 1951-'55	0	0	0	1	1	—	—	0	2		•• .50
TOTAL	1	8	6	5	20	5.200	> .10	16	24		•• .27
TOTAL S. PAULO (1)	49	49	39	49	186	1.613	> .50	186	186	—	—
TOTAL S. PAULO (2)	48	41	33	45	167	3.036	> .30	170	164	.108	> .70
TOTAL CURITIBA (1)	50	62	61	77	250	5.904	> .10	223	277	5.832	> .01
TOTAL CURITIBA (2)	50	62	61	76	249	5.474	> .10	223	275	5.430	> .01
GRAND TOTAL (1)	99	111	100	126	436	4.349	> .20	409	463	3.344	> .05
GRAND TOTAL (2)	98	103	94	121	416	4.096	> .20	393	439	2.543	> .10

• With correction. Without it, $\chi^2 = 8.526$ ($P > .02$).
•• Calculated through exact methods for $n < 50$ in the binomial and $n < 20$ in the multinomial distribution.
1 Including the data on "other degrees." 2 Not including them.

TABLE 2

RELATIVE INCIDENCE OF THE FOUR TYPES OF FIRST COUSIN MARRIAGES IN TWO BRAZILIAN POPULATIONS

Archdiocese	First cousins	First cousins once removed	Second cousins	Total
São Paulo	B > A > C > D A + B > C + D	A > D > C > B A + B > C + D	D > A > B > C A + B > C + D	A > D > B > C A + B > C + D
Curitiba	D > B > C > A A + B < C + D	D > B > C > A A + B < C + D	D > A > B > C A + B < C + D	D > B > C > A A + B < C + D

moved and second cousins, we may summarize the above by saying that A always involves relationship through two mothers, B through husband's mother and wife's father, C through husband's father and wife's mother, and D through two fathers.

Origin of the Data

The data to be presented below have been obtained from an analysis of the files of two Brazilian Archdioceses (São Paulo and Curitiba). For a discussion of the validity of extrapolating from such data to the whole population, see Freire-Maia, 1957.

Age Effect

The four kinds (A, B, C, D) of uncle-niece and aunt-nephew marriages occurred 0, 0, 6 and 8 times, respectively, in the Archdiocese of São Paulo in 1910 and 0, 0, 3 and 0 times in the Archdiocese of Curitiba during the years 1951-1955. The failure to observe a single aunt and nephew marriage is probably attributable to an age effect. It is interesting to note that apparently it is unimportant whether an uncle is related to his niece through her father or her mother.

Another probable age effect is observed in marriages between first cousins once removed in São Paulo (1910 and 1943), where the husband was a member of the parental generation of his wife in 23 out of 27 marriages studied ($\chi^2 = 12.00$). In Curitiba, this age effect does not occur—the husband belonged to the parental generation of his wife in 26 out of 45 marriages ($\chi^2 = 1.35$). The difference between the two samples is significant ($\chi^2 = 5.83$).

Influence of the Parental Sex

Table 1 presents some data regarding the four basic structures of cousin marriages in the two Brazilian Archdioceses previously mentioned. Of the departures from equality in the frequencies of the four types within each sample and population, only the one with reference to second cousin marriages in São Paulo is significant. However, it is interesting to note that in Curitiba, the relation A + B < C + D (i.e., the reversal of that found in modern Europe and Japan) is consistently observed, whereas in São Paulo the reverse A + B > C + D invariably obtains (*cf.* Table 2).

From the present data, it is possible to detect the frequency of the parental sex through whom the relationship occurs: relationship is through females in 2A + B + C of the cases and through males in B + C + 2D of the cases. Significant excess of relationship through males is found in Curitiba in first cousins once removed and the total, but no significant deviations are found in São Paulo (see Table 1).

DISCUSSION

Possible Origins of the Heterogeneity

Analysis of the incidence of the four classes A, B, C, and D within each kind of consanguineous marriage provides a means of obtaining some information on the factors responsible for the observed heterogeneity. Table 3 summarizes the data available in the literature regarding first cousins. In Austria and Germany, the relation A > B > C > D has been found; in Japan, A > B > D > C; in Britain, A > C > B > D; in the highly heterogeneous information

gathered by Macklin in Europe, D> B> A> C; and in the data gathered from the literature by Haldane and Moshinsky, A> C> B = D. In the latter two instances the deviations from A = B = C = D are not significant. In spite of this diversity, the data, with the exception of two of the six sub-samples gathered by Macklin, reveal the same basic relation A + B> C + D. We have found the same relation in the São Paulo 1943 sub-sample (10 : 5) and in the São Paulo total sample (51 : 47) but not in the São Paulo 1910 sub-sample (41 : 42), nor in the Curitiba sample (52 : 61) nor in the total (103 : 108); the departures from A + B = C + D are not significant, however. It is interesting to know that the relation A + B< C + D has been also found by Sanghvi *et al.* (1956) in some contemporary endogamous groups in Bombay (Table 3) and by Anderson-Smith (1865), Rodet (1865), and Voisin (1866) in England and France in the last century. The four kinds of first cousin matings (A : B : C : D) were present in their data as 7 : 1 : 3 : 8 (Anderson-Smith), 1 : 1 : 1 : 2 (Rodet) and 1 : 0 : 2 : 2 (Voisin) with a total of 9 : 2 : 6 : 12 (26 mothers : 32 fathers). These data are not significantly different from A + B = C + D, however.

With the exception of the Indian and the 19th century European studies, these data reveal an excess of mothers through whom relationship occurs, whereas in our data an excess of fathers is observed in the total data from Curitiba and in that from São Paulo regarding second cousins (1910 and total) and "other degrees" (1910). The differences from those expected if only chance prevailed are, however, significant only in the case of first cousins once removed and the total from Curitiba.

A series of factors has been suggested to explain the deviations detected in European populations: differential mobility of men and women (Haldane and Moshinsky, 1939), mean age difference, maternal influence, Oedipus complex (Ludwig, 1948, 1949, to whom the first and fourth factors seem to be the most important), and, at least in Great Britain, "a prejudice against a marriage of persons with the same surname" (Shields and Slater, 1956). The excess of males in some of our data shows that no one of these factors could be of any great importance in Brazil. The data suggest, however, the existence of some variety of paternal influence.

Genetic Implications

The incidence of the several sub-types of consanguineous marriages may have genetic consequences (*cf.* Haldane and Moshinsky, 1939; Wright, 1951). The classes A, B, C, and D of first cousins have, for instance, the same inbreeding coefficient for autosomal genes ($f = 1/16$) but different ones for sex-linked genes ($f' = 3/16$, $1/8$, 0 and 0, respectively). Thus, populations with the same incidence of consanguineous marriages but different distributions of the sub-classes of first cousin unions may have different values of f'. For other degrees of cousin marriages we also find $f' = 0$ for subtypes C and D, and $f' > 0$ for subtypes A and B. Accordingly, cultural patterns favoring the "European" system A + B> C + D, tend to increase the average value of f over that obtaining where the system A + B < C + D or A = B = C = D is favored.

Another point to be mentioned is that as cross-cousin marriages (B and C) have a mean f' (1/16) lower than that for parallel cousins (3/32), mating patterns which favor one or the other of these classes may have dissimilar genetic consequences. The preference for class B and/or C unions is a common feature in a large number of social organizations (Levi-Strauss, 1956; see Emeneau, 1939, and Sanghvi *et al.*, 1956, for Indian castes; Pearson *et al.*, 1911, for Fijian populations; Hsu, 1945, for Chinese villages; Lowie, 1949, for South American Indians; Schapera, 1953, for African communities, etc.).

TABLE 3

INCIDENCE OF FOUR TYPES OF FIRST COUSIN MARRIAGES IN EUROPE, JAPAN, AND INDIA

Authors	Region	First cousin marriages (1)				
		A	B	C	D	Total
Orel, 1932	Wien, Austria	274	230	169	149	822
Ludwig, 1948, 1949	Trier, Germany	209	204	155	150	718
Ludwig, 1948	Mainz, Germany	173	157	148	131	609
		656	591	472	430	2149
		A+B = 1247		C+D = 902		
Morton, 1955	Japan (2)	229	184	127	149	689
		A+B = 413		C+D = 276		
Macklin, 1952	(3)	63	68	46	70	247
		A+B = 131		C+D = 116		
Haldane and Moshinsky, 1939	(4)	30	21	24	21	96
		A+B = 51		C+D = 45		
Shields and Slater, 1956	Great Britain	32	14	17	12	75
		A+B = 46		C+D = 29		
Sanghvi, Varde and Master, 1956	India (5)	75	48	87	80	290
		A+B = 123		C+D = 167		

1) Nomenclature according to Haldane and Moshinsky (1939) and Ludwig (1948), not to be confused with that of Orel (1932).

2) Data obtained, from 1948 to 1952, in Hiroshima, Nagasaki and Kure, by the Atomic Bomb Casualty Commission.

3) Total of data obtained through several sources.

4) The authors do not specify the way in which these data were obtained. It is possible that some of them are the same already gathered by Macklin (1952).

5) Some endogamous groups in Bombay. Numbers here presented have been calculated from percentages.

Summary

The incidence of the sub-types of consanguineous marriages in two Brazilian populations is presented. The differences in the frequencies of these consanguineous marriages in Brazil, Europe and Japan are discussed and the genetic implications are briefly reviewed.

II

FACTORS OF GEOGRAPHIC DISTRIBUTION

Introduction

The geographic distribution of the inbreeding levels is highly heterogeneous in Brazilian populations (for data, see Freire-Maia, 1952, 1954, 1957a, 1957b). In the Southern States, for instance, the frequencies of first cousin marriages are in the neighborhood of 1 per cent, the "total" frequency of consanguineous marriages (up to and including second cousins) is commonly in the neighborhood of 2 to 3 per cent, and the mean coefficients of inbreeding (Wright's F) are almost always near 0.001. A sharp transition exists between the contiguous populations inhabiting the northern part of the State of São Paulo (South) and those of Minas Gerais (East), where relatively high rates of inbreeding are characteristic. The frequencies of first cousin marriages found in Minas Gerais dioceses range from 2.06 per cent to 6.32 per cent, with corresponding values of F from 0.00170 to 0.00537. The foci of the highest inbreeding occupies a large Northeastern region and a small Eastern zone, no data being available for the populations living in the area between them. Frequencies of first cousin marriages and "total" frequencies as high as 8.42 per cent and 15.53 per cent, 9.10 per cent and 21.84 per cent, 9.50 per cent and 17.53 per cent, 10.67

per cent and 20.97 per cent, with corresponding coefficients of inbreeding equal to 0.0074, 0.0083, 0.0083, and 0.0097, have been detected in these populations. All the other Brazilian populations studied exhibit inbreeding levels intermediate between these high Northeastern and Eastern values and the low Southern ones.

The Factors

It is difficult to evaluate the specific factors which account for these differential inbreeding rates. The socio-economic features of the South (sometimes referred to by sociologists as the "New Brazil") are, however, quite different from the other four physiographic regions taken together (called "Old Brazil"; see the maps in Freire-Maia, 1957ab). The following is but a summary of the main traits that distinguish both zones:

1. *Ethnic composition and cultural pattern.* The populations of "Old Brazil" have their origins, in the main, in or prior to the 18th Century. On the other hand, the Southern populations present an aspect of newness absolutely absent in the former ones due to recent waves of immigration. The various migratory movements brought to "New Brazil" a somewhat different feature, not only reflected in economic development and religious composition but also in changing social habits introduced by the first non-Indian occupants of the land. But immigration also produced an increase in the size of the Southern isolates with its well-known effect on the inbreeding rates.

South Brazil presents a quite heterogeneous population structure from the ethnic viewpoint with relatively high proportions of Italian, German, Polish, Japanese and Ukranian people and their descendants, as well as people of Portuguese and Negro origin. "Old Brazil" has a relative ethnic homogeneity resulting from past and continuing intermarriage of the Portuguese, Negro, and Indian stocks, together with a low frequency of people of other origin.

In the first century of political independence (1822-1922), it is estimated that Brazil received about 5,100,000 foreigners, with 29 per cent Negro (until 1859), 59 per cent Mediterranean (Italian, Portuguese, Spanish, Syrian, and French), 7 per cent Central-European (German, Russian, Polish, Austrian, English and Swiss), 0.5 per cent Asiatic and 4.5 per cent of other origins (Nash, 1950). This group has not been equally distributed over the country but has shown, in general, a clear preference for the South. The State of São Paulo, with 8 per cent of foreigners, received about 860,000 immigrants from 1887 to 1900 (Monbeig, 1954), and this contingent seems to be much higher than half the total received by the whole of Brazil in the same period. Also, the ethnic distribution has been highly preferential, the Italian influence being greater in São Paulo, the Polish in Paraná, the German in Santa Catarina, the Portuguese in the Federal District, etc.

Another point deserves special mention. The majority of the Negro population is found in "Old Brazil" (mean frequency about 13 per cent†) with high concentrations in some points, while the South has much less (about 6 per cent). The Southern populations have about 87 per cent white people and the rest of Brazil only 49 per cent. Comparison of the mulatto frequencies is somewhat more impressive in that there is just 4 per cent in the South and 37 per cent in the rest, with a frequency as high as 64 per cent in the Northern region. However, in the South, due to low intermarriage rates, the highest frequency of Negroes within the populational fraction Negroes + Mulattoes is found (about 61 per cent), whereas there are 31 per cent in the other Brazilian regions as a whole (Barreto, 1951).

Comparisons regarding Asiatics are also impressive, there being 2 per cent in the South and about 0.04 per cent in all

†All the census information reported in this paper has been obtained in 1950 when not otherwise specified.

the other regions. (The frequency in the North is less than 0.01 per cent.)

2. *Economic level.* The South has an economic situation much better than the rest of Brazil. The best examples are the State of São Paulo (8,500,000) with its solid agricultural activities, its growing industry and the best Brazilian system of communication, the northern region of the State of Paraná (Diocese of Jacarèzinho) with its new and rich coffee plantations and several newly founded and fast growing towns, and the southernmost State of Rio Grande do Sul. São Paulo is the richest and most progressive State, its capital growing at an unusually rapid rate. The better situated states of "Old Brazil" (Minas Gerais, Pernambuco, and Bahia) do not show the same rhythm of development found in the South.

The economic level of a region seems to be an important factor acting on inbreeding rates as it has a preponderant role in the quality and extension of transportation as well as in opportunities for immigration.

3. *Religious structure.* The greatest part of the Brazilian population is composed of Roman Catholics (93.5 per cent), with Protestants (3.4 per cent) and Spiritualists (1.6 per cent) forming the main portion of the non-Catholic people. The Catholic percentage in the South (89 per cent) is significantly lower than that found in the rest of the country (96 per cent). This seems to be a reflection, at least in part, of the ethnic composition of each zone. It is difficult to ascertain the influence of the distribution of different religions on the inbreeding rates, which are generally higher where Catholics are more frequent. Ecclesiastical authorities commonly emphasize the undesirability of consanguineous marriages for genetic reasons, but dispensations from the canonical prohibitions are given if the related parties maintain their wish to marry and present at least one "important" reason (or two or more not so important). This means that practically all the dispensations asked for are granted. The same situation obtains in France (Sutter and Tabah, 1948) and probably in Netherlands (see Oostingh, 1957, for data on a Roman Catholic isolate) but not in Japan (Schull, 1953) where the Nagasaki Catholic population shows an inbreeding level only one-third the expected one if randomness prevailed. These Japanese data seem to show that, at least in some countries (but not apparently in Brazil), Catholic canon laws may work as a powerful factor in lowering the inbreeding rates. Recent research by Kilpatrick, Mathers and Stevenson (1955) show that in four (data were not available on the other two) counties in Northern Ireland the frequency of first cousin marriage is significantly smaller among Catholics than among Protestants. Also in India it was found that the inbreeding level of Catholics is much lower than that of non-Catholic groups at Bombay (Sanghvi, Varde and Master, 1956). The data obtained by Shields and Slater (1956) in Great Britain also showed a small deficiency of Catholics among a group of consanguineous families in comparison to non-consanguineous families.

4. *Degree of literacy.* The rates of literacy are quite different in the major zones of Brazil. Illiterate people constitute 64 per cent in "Old Brazil" (75 per cent in the Northeast) and 43 per cent in the South. However, we are confident that this could not have any great influence *per se* on inbreeding rates.

5. *Population density.* As a whole, the South is more densely populated than the rest of the country. The four regions that form "Old Brazil" (North, Northeast, East and West-Central) present, respectively, about 0.5, 13, 15 and 1 inhabitants per km², while the South has a value of 21, bringing the Brazilian mean to 6. A great heterogeneity is found within each region. For instance, in the Northeast, where the highest inbreeding rates are found, we have densities as low as 4 and 5 inhabitants per km² in Piaui and Maranhão and as high as

35 and 38 in Pernambuco and Alagoas. This heterogeneity is also found within each state. For instance, the western parts of the States of Paraná and Santa Catarina (which once formed the Territory of Iguaçú) had, in 1940, a density of 1.5 while the rest of these States had, respectively, 8.1 and 14.2. The inbreeding coefficients of this poorly populated region (Prelacies of Palmas and Foz do Iguaçú) are lower than those detected in the more densely populated regions like the northern and eastern parts of Paraná (Diocese of Jacarèzinho and Archdiocese of Curitiba, the State capital) and the coastal region of Santa Catarina (Archdiocese of Florianópolis, the State capital).

In some very poorly populated areas of the North and Northeast (e.g., Pará with a density under 1), low inbreeding rates have been observed, while in some more densely populated areas (e.g., Minas Gerais with 13, Sergipe with 31, and Pernambuco with 35), high frequencies of consanguineous marriages were found. This seems to be proof that population density, in spite of its importance (*cf.* the analysis of this problem in Freire-Maia, 1957b), is not *by itself* a very powerful factor in the genesis of the phenomenon. The fact that high inbreeding levels have been shown even in urban populations of such a small and heavily populated country as Japan (Neel *et al,* 1949; Kida *et al,* 1949; Tanaka, 1952) agrees well with the present findings.

6. *Internal migration and degree of ruralization.* There are two types of internal migration: rural to urban migration and the search for the so-called pioneer fronts with a consequent pushing forward of the frontier. Both movements were very intense in the last decades. For instance, from 1940 to 1950 the increasing rates of rural and urban communities have been as different as 18 per cent and 49 per cent, the highest rate of the urban increase (68 per cent) being found in localities with 50,000-100,000 inhabitants. Belo Horizonte, with 350,000 inhabitants, increased about 91 per cent in the above period (Monbeig, 1954).

The rural exodus has two opposite effects on the stability of populations, namely, increasing the "isolate" size of towns, and decreasing the size of the isolate in rural communities (*cf.* the data on France in Dahlberg, 1938). In growing populations like that of Brazil, the size of urban populations increases both through immigration and a natural population increase, whereas in rural communities, as emigration has an opposite effect to the natural population increase, the size of the breeding population generally increases much more slowly.

It is a well-known fact that high inbreeding rates are generally associated with rural, or predominantly rural, populations. From the analysis of the 50 Brazilian localities tabulated in a previous paper (1954), it is clear that, on statistical grounds, the coefficients of inbreeding are directly proportional to the respective degrees of ruralization. Table 4 summarizes these data, each set being the mean for 10 localities. Ruralization is thus an important positive factor acting on the frequencies of the consanguineous marriages. As the Brazilian urban populations increase (through migration) at rates much higher than the rural ones, we think this differential increasing rate is acting as a powerful factor in the decreasing inbreeding rates.

The tendency for the close association between high coefficients of inbreeding and rural communities detected in many different countries is not an absolute one, how-

TABLE 4

ASSOCIATION BETWEEN INBREEDING AND "RURALIZATION"

Mean coeff. of inbreeding (F)	Mean ruralization index*
0.0083	4.5
0.0036	5.5
0.0016	1.7
0.0007	0.1
0.0004	0.1

* Ratio of the rural part of the population to the urban one. Rural is here defined on the domiciliar and not occupational point of view.

ever. It is not uncommon, for instance, to find small towns surrounded by wide rural areas with frequencies of consanguineous marriages lower than predominantly urban populations (*cf.* Freire-Maia, 1954; for European populations, see Sutter and Tabah, 1948).

The great pioneer zones in Brazil are some regions in the State of São Paulo, the north of Paraná (with its numerous coffee plantations and fast-growing, newly founded towns) and the south-central of Goiás and Mato Grosso. Of these four main fronts, the first two, located in Southern Brazil, are the most progressive ones, migration to the South being much more intense than the so-called "march to the West." For instance, the State of Paraná had in the decade 1940-1950 the highest demographic increase, and it also was the State with the highest frequency (about 33 per cent) of persons born in other States. In Londrina, the largest town in the northern part of Paraná, during the period 1953-1954, about 52 per cent of the Catholic marriages were contracted between parties born in different States, 57 per cent of these being from the neighboring State of São Paulo and only 17 per cent from Paraná. It is illuminating to compare these values with the situation in the central and very populous (about 7,700,000 inhabitants) State of Minas Gerais, with regions showing frequencies as high as 6 per cent of first cousin marriages but with less than 0.5 per cent foreigners and only 3 per cent of the people born in other States, as well as with the highest developed State of São Paulo, whose values are, respectively, 13 per cent and 8 per cent. It must be remembered that the central part of the Northeastern region, where the highest coefficients of inbreeding have been found, is a zone characterized by constant droughts which cause a large mass exodus, and also it receives little migration from other parts.

The relatively low inbreeding rates found in some regions of Goiás and Mato Grosso (with their stock-raising and agriculture) and Pará (rubber front) seems to be, at least in part, also a consequence of the internal migration. In Goiás, for instance, one-fourth of the whole population was born outside the State's limits. In an isolated population in this State, however, a high inbreeding level (7 per cent of first cousin marriages among urban and 15 per cent among rural families) has been observed (Frota-Pessoa and Filgueiras, 1957).

Internal migration seems to be, by itself, a very strong factor controlling inbreeding rates. It develops an isolation between a great number of related people as well as increases the probability of marriage between non-related ones in the communities that receive the migration waves.

Conclusion

Cultural pattern, economic level, migration and degree of ruralization seem to be the most effective factors responsible for the maintenance of the differential distribution of the inbreeding levels in Brazilian populations. Population density, in spite of its importance, is not by itself a very powerful agent. Religious structure, a factor probably effective in some other countries, seem to be unimportant in Brazil. Degree of literacy also does not seem to play an important role, *per se*.

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BOOK REVIEWS

THE SANCTITY OF LIFE AND THE CRIMINAL LAW: Glanville Williams. Alfred A. Knopf, New York, 1957, 350 pp., $5.00.

The purpose and nature of this profound and thoughtful series of essays, an amplified version of the James S. Carpentier Lectures which Mr. Williams delivered while he was Visiting Professor on the Law Faculty of Columbia University in 1956, is best expressed in the author's own words quoted from the preface. He writes:

"This is a book of legal argument, of social history, of philosophy and biblical texts. It treats of monsters and morons, reproduction and repression, eugenics and enthanasia, original sin and the origin of the soul. The connecting thread is the extent to which human life, actual or potential, is or ought to be protected under the criminal law of the English-speaking peoples." Let us attempt to follow this connecting thread.

The first section, "The Protection of Human Life," treats the question of infanticide, which is dealt with in England under the Infanticide Act and in the United States usually as second degree murder. A concluding plea is made for "a greater exercise of discretion of prosecuting authorities to refrain from prosecuting. . . . A legal inquisition into conduct is not justified on moral or religious grounds if no sufficient social purpose is to be served."

In the next section, Catholic opposition to "The Control of Conception" is discussed from a coldly logical point of view. "The permission to use the rhythm method seems to make further resistance to birth control on the part of the Catholic community difficult to defend. . . . Since sexual intercourse may rightfully take place without the aim of procreation, the old tendency to find something unclean and sinful in the sexual instinct seems to have been given up. Thus the whole controversy is narrowed to the means used to obtain family limitation." Yet, Mr. Williams points out, in the United States the question of inculcating birth control as part of a Public Health program, where it is most needed, is considered "political dynamite."

The section which follows is concerned with sterilization. After describing the nature of the operation, a thorough-going discussion removes many misconceptions current regarding legal status, indications, and results. To the recurring argument against sterilization—its irrevocability—the author points out succinctly that the birth of an unwanted child is also irrevocable. Mr. Williams agrees with the recommendation of the Brock Committee in England that to clarify the legal status a voluntary sterilization statute would be highly desirable. "The essence of a voluntary system," said the committee, "is that those who object should be free to do so. What matters is that there should be no compulsion."

In the section on "Artificial Insemination," which follows, the author quotes a statement made by the American Society for the Study of Sterility: "If it is in harmony with the beliefs of the couple and the doctor, donor artificial insemination is a completely ethical, moral and desirable form of medical therapy. . . ." Again, the legal question crops up. The recommendation here is that legislation be passed to legalize children born of AID (artificial insemination donor) with the husband's consent.

The two following sections are devoted to abortion: the first to the Law, the second to Morality and Social Facts. The question is raised: "Whether the church and the state made a mistake in attempting to extend the protection of human personality to the moment when the microscopic ovum is fertilized, and whether it would be wise to recognize that the legal prohibition has

broken down, and to fix some lesser limit of protection that is more in accordance with human needs, public opinion and the possibilities of enforcement."

The final two sections on "Suicide" and "Euthanasia" merge into each other philosophically and legally. For it is suggested that the law "might well exempt from punishment the unselfish abetment of suicide and unselfish homicide upon request. This rule would solve at a stroke the problem of voluntary euthanasia in cases of fatal illness. It would go much beyond the legal change usually advocated by supporters of euthanasia, because it would not be limited to persons suffering from an incurable and painful illness."

With knowledge and insight, the author has "attempted to keep the treatment objective, but being objective does not mean being impartial." And so, following the connecting thread, "the extent to which human life, actual or potential, is or ought to be protected under the criminal law of the English-speaking peoples," we learn the author's humanitarian and progressive approach to these problems.

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Let's Have A Better World: Daniel Wolford La Rue. Exposition Press, New York, 1955, 240 pp., $4.00.

Proposals for improving the world are cheap; probably every thinking person could offer his own. Those few that reach the public in book form tend to have a strong religious or mystical bias and to antagonize scientists by misapplying or misinterpreting scientific arguments. "Let's Have a Better World" refrains from seeking support in the mystical but makes about the usual proportion of factual and logical errors.

What the author really seems to mean is, "Let's have a world more like the U. S. A.," but peopled only with "high-grade persons." The means he proposes are, essentially, a democratic world federation and a concerted program of eugenics. "The world's basic trouble is immorality. The basic cure must be sought in heredity. What education and situation can do depends on inheritance" (p. 183).

The book devotes page after page to ideas that must be commonplace to educated, thinking people, but its numerous errors would be dangerous food for the minds of more naive readers. Most objectionable is the author's reckless tendency to oversimplify and to generalize. Thus on page 56 he says, "If the world, in place of its present population, could have two billions like our best, war would cease, vice and crime would disappear, poverty would vanish, international problems would dissolve like a sunny mist, and most reformers and policemen would have to find a new occupation." From our present knowledge of man it does not appear possible to separate good qualities from bad on any roster of names. Many great contributions to civilization have come from persons whose personal or public lives were notoriously "immoral." A world populated with ne'er-do-wrongs as selected by La Rue's proposed tests would probably stagnate or regress to barbarism within a few generations. Man's unpleasant, as well as his pleasant, qualities have been selected by nature because they promoted the success of the species. A system of human artificial selection would improve man only if it recognized and respected a myriad of useful personality types, each with some defects.

Some of the author's reasoning is careless. Starting with the admittedly crude estimate that "we are 80 per cent 'born,' 20 per cent 'made'," he recommends that "for every dollar we spend to better the environment we should lay out four or five to improve inheritance" (p. 149). But this hardly follows, even granting the initial assumption, as long as a dollar spent to improve the environment will bring more results than a dollar spent to improve heredity.

In another error La Rue is no more culp-

able than many other writers: "Environment, though powerless to create, can restrict or destroy horribly" (p. 65). He himself supports the thesis that environment and heredity jointly control physical and psychological development. But if this is so, then their effects cannot be separated, and they are jointly destructive and jointly creative.

La Rue's proposal that marriage licenses be of two kinds, *with* and *without* privilege of parenthood, can hardly be taken seriously. His calls for better education, wider voluntary birth control, and eugenic research have been heard before.

Among his countless restatements of familiar truths, the author has occasionally clarified an issue. On page 98 he points out the relativity of the concept, "underprivileged": "We need to remember that the most grossly underprivileged are those whose *opportunity* for self-realization is farthest under their *capacity* for it."

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HEREDO-RETINOPATHIA CONGENITALIS: Carl Henry Alström and Olof Olson. Translated by Erica Odelberg. Berlingska Bocktryckeriet, Lund, Sweden, 1957, 178 pp., $2.50.

The clinical syndrome described by the authors has been found in about 10 per cent of the children admitted to Swedish schools for the blind. It results in impaired vision, which was always observable within the first year of life and was usually classified as retinochoroiditis, amaurosis, or amblyopia congenita "not due to any known cause." A frequent concomitant consisted of irregular, nystagmus-like movements. The retinochoroidal changes were "variable and uncharacteristic," which may explain why this hypothetical disease entity has not been previously identified as such. This is another instance where delineation of a special syndrome was made possible by combining genetic studies with extended clinical observations.

The data presented in this monograph are based on 105 families with 175 affected and 303 unaffected individuals among the sibs of the index cases. The parental rate of consanguineous marriages was also very high, as the parents of 16.2 $\pm$ 3.6 per cent of affected sibships were first cousins.

Application of Weinberg's proband method showed a frequency of affected persons in the proband families of 22.4 $\pm$ 2.0 per cent, while Haldane's method yielded a rate of 27.4 $\pm$ 2.5 per cent. According to Hogben's method, there is evidence for an autosomal, recessive mode of transmission with complete manifestation in the homozygote. The frequency of the trait in the general Swedish population is 3 in 100,000. Assuming panmixia and equilibrium in accordance with the Hardy-Weinberg law, the gene frequency has been estimated at 5 or 6 in 1,000, and the heterozygote frequency at about 1 in 100. The marked variability occurring within each sibship, within a family, and in the same individual at different ages, may be due to the effects of genetic modifiers. The "main gene" may actually involve two or more alleles which cause different degrees of retinal impairment.

The observation of a higher-than-expected frequency of affected members in smaller sibships suggests the operation of nongenetic factors with family-limiting effects. The fertility and marriage rates of affected persons are much lower than those of the general population, with a reduction of the marriage quota to 47 per cent in the males, and to 29 per cent in the females.

This well-documented study conforms to the fine standards set by the rapidly growing library of Scandinavian monographs on genetic problems and represents a valuable contribution to the current literature of medical genetics and eugenics.

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ENURESIS: A CLINICAL AND GENETIC STUDY. By Bertil Hallgren, Copenhagen: E. Munksgaard, 1957, pp. XII + 159, 64 tables.

The aims of this broad clinical and genetic study are (1) to describe the clinical forms of enuresis, (2) to determine their association with physical, mental and environmental factors and to consider the nature of the relationship and (3) to see if any group of genetically determined enuresis can be distinguished, and if so, determine the probable mode of inheritance.

The material comprised 203 probands collected from psychiatric departments of two children's hospitals, together with their families. Examinations were by personal interviews, usually with the mother. The probands as well as most of their siblings underwent full psychiatric, medical and neurological examinations.

Clinically, a distinction was made between primary enuresis (continuous since birth) and acquired enuresis (recurrence of wetting after a dry period of one year), as well as between the diurnal and nocturnal form. Solitary and familial cases were also placed in separate categories.

Sex differences were found in the age of cessation (later in boys) and in the combination with encopresis (more frequent in boys). A possibly important relationship between pyloric stenosis and enuresis in boys was noted, although this was not statistically significant if only radiologically verified cases are considered.

No relationship was found between enuresis and urinary tract disorders, premature birth, bronchial asthma or convulsive disease.

Behavior problems were more frequent among the probands than among either their affected or unaffected siblings, simply because they were a group of children selected from psychiatric clinics. At the same time affected siblings showed a higher incidence of behavior and speech disorders, emotional immaturity and general nervousness than unaffected siblings or children in the general population.

A higher incidence of broken homes, maternal psychiatric disorders and unfavorable socio-economic background was found among children with both nocturnal and diurnal enuresis, while separation between mother and child was greater in all groups. Cases of "acquired" enuresis seemed even more likely to be precipitated by emotional stresses, such as birth of a younger sibling or separation from parents.

Genetic analysis of the material showed a higher morbidity rate for nocturnal diuresis in the male. For each sex, the morbidity rate was higher in parents and siblings of probands than in the general population (as determined in previous studies by the author of this monograph). This difference was greater in the case of primary enuresis than for the acquired type.

Because of the lack of homogeneity in the affected population and overlapping in the clinical cases, however, it was not possible to determine with certainty the mode of inheritance of the supposed "genetic" nocturnal enuresis. The author favors the theory of simple dominance with a 75 to 80 per cent penetrance among males and 40 to 50 per cent among females. The manifestation would be modified by the action of polygenes as well as the external environment, although a solely polygenic type of inheritance cannot be ruled out. Of interest is the fact that no increased mortality or decreased fertility was found among the affected cases, leading one to speculate that the disorder is increasing in the general population. On the other hand, certain observations, e.g., the high incidence of heavy sleep, developmental disturbance, E.E.G. and cystometric anomalies seem to point to a connection between enuresis and central nervous system dysfunction, rather than localized disorders of the urinary tract, a finding which may cause negative selection in severe cases.

At any rate, although the results of this study are somewhat disappointing from a

genetic standpoint because of the nature of the material, the careful clinical and genealogic analyses are extremely valuable and suggest further research into the nature of this important childhood disorder.

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MARRIAGE AND THE UNCONSCIOUS: Edward F. Griffith, Secker & Warburg, London, 1957, 221 pp., $5.25.

This volume represents another challenging attempt to popularize psychoanalytic precepts. Written in the main for the laity, it differs from most of its American counterparts in the religious connotations of the Jungian approach adopted by the author. By implication, its purpose is to resolve the reader's conflict between spiritual-moral and instinctual-sexual needs. On the whole, the emphasis is on the value of psychotherapy as a means of bringing about a rapprochement between these two forces in marital partners whose difficulties somehow derive from such conflicts.

The stories of your marriages approaching disintegration, with the problems and people involved and with the denouements achieved by psychotherapeutic implementation, serve to illustrate the author's thesis. In further explication there is a simplified outline of ontogenetic features characteristic of neurotic qualities which may lead to marriage failures.

In the subsequent discussion, efforts are made to reconcile the teachings of Christ on marriage with the goals of modern psychology and health standards. Anglican and Papal interpretations of pertinent biblical quotations are compared with psychological theories, with a view to differentiating literal meaning from intent. Biblical intent is found to be in consonance with the mystical intuition of Jungian concepts as applied to the practicalities of daily life.

This section prefaces an extensive critical exposition of the practices of both the Church (Anglican) and the State (Great Britain) regarding sex education, marriage preparation, and legitimate causes for divorce and annulment. Some current attitudes are regarded as anachronistic and biased, and a strong plea is made for liberal reforms.

The book is of interest as a social document, since it reflects current marital and cultural problems which prevail in England and to some extent have also been noted in the United States. Its perusal may afford relief to those Britons who are in relatively mild conflict regarding their religious and instinctive needs. For others, there is an appendix listing British and American agencies which provide marriage counseling services. The appendix may be helpful for referring physicians.

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LES CARACTERES DES ORGANISMES VIVANTS: Maurice Rose, Presses Universitaires de France, Paris, 1957, 199 pp.

The author of this book is endeavoring to show that realization of the traits in the whole of the living realm is governed by unitary principles. Everywhere one finds the self-reproducing protein molecules, safeguarding the perpetuation of the specific trait through generations. And on all organization levels the writer encounters hormone-like substances as tools, shaping individuals' morphology through developmental steps following each other in an orderly sequence.

The organisms are viewed here as mosaics of characters. In a flowing narrative, packed with instructive examples, the constancy as well as the metamorphoses of traits are traced in individual lives, in population interactions, and through generations. Ample examples are brought forth to illustrate the author's main thesis: namely, that the general processes in morphogenesis, i.e., the active substances and

the mechanisms, are of the same nature from the ovum to the adult, and from the unicellular organisms to higher plants and animals. The deployment of the potentialities stored in the ovum is achieved by hormones operating through organizing centers, morphogenic fields, and gradients. The earliest event in this deployment is the differentiation of the euchromatines and heterochromatines, heralding the separation of the germinal and somatic materials. One of the last significant events in the developmental sequence is the organization of a complex endocrine apparatus. Even in the unicellular organisms, mechanisms of endocrine nature can be seen. According to the author, the nucleus is acting as a kind of a rudimentary hypophysis since it secretes materials from which the nucleoproteins are built.

The genes, as self-reproducing nucleoprotein macro-molecules, probably employ similar mechanisms in bringing about the specific traits. It seems that they, too, are secreting diffusible substances governing the development of the form.

A substantial part of the book deals with the inheritance of acquired characters. It is not surprising to find that a French biologist is trying to find a modern role for the vestiges of the great Lamarckian tradition. The author's endeavor at working out a formula of compromise between the "mutationists" and the Lamarckians is not only apt to evoke the readers' sympathy but is also reasonable and stimulating. In fact, a concept is offered according to which the difference between true mutations and somatic modifications is one of degree only. In this concept, the differences between various trait changes are dependent not only on the quality and intensity of the stimulus but also on its timing. The gene is connected with the character through a chain of reactive steps. External forces can interfere with the morphogenic process at any step, at any distance between the gene and its final product. With increasing distance from the gene the factors capable of causing a modification will be more numerous, but their effect will be less pronounced and less likely to be transmitted to the descendants. Thus one can visualize a graded series of trait changes of various genetic durability, ranging from plain somatic modifications to true mutations. In this schema, mutation represents an extreme variant of a continuous series and is therefore not separated from other trait changes. The author concludes with the question: Is there really a problem of heredity of acquired characters in the traditional meaning?

The book offers a useful review of facts under an original plan and is quite readable. Controversies are presented skillfully and with a detachment that should stimulate the reader to further inquiry.

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PERIODICAL REVIEWS

GENETICS

Inheritance of mental ability. C. Burt. *Nature* **179,** (1957), pp. 1325-1327.

Efficient utilization of human resources urgently requires more research on the determinants of intellectual capacity and on ways of recognizing and nurturing high capacity at an early age. There is much evidence to show that differences in capacity exist from birth. Foster-child studies have demonstrated wide individual differences in a uniform environment. In Britain comparisons of nearly 30 pairs of identical twins separated in infancy show psychological test differences between partners little greater than between successive tests on a single child. Wide variations often observed in families indicate that, in addition to multiple small genetic factors, some major factors also affect intelligence. Knowledge has gone far enough to warrant extensive research in the schools, but much is also to be gained from more animal studies.

A genetic study of gargoylism (Étude génétique du gargoylisme). M. Lamy *et al. Journal de Génétique Humaine* **6** (1957), pp. 156-178.

Gargoylism is a form of hereditary mental defect associated with characteristic physical deformities and a progressive, fatal disturbance of body chemistry. It was long considered a simple recessive disease, but a second form has come to light in recent years that is due to a gene on the sex chromosome. This article reviews the literature and adds observations on 20 new cases. The authors conclude that, while all affected females have the classical form, about a third of gargoyl boys have the sex-linked type. The appropriate genetic counsel to give parents depends on which form of the disease their children have. When this cannot be determined from the pedigree, the presence of an eye defect (corneal opacities) rules strongly against the sex-linked form; deafness and heart defects, somewhat in its favor.

The effect of heterozygosity for new mutations on viability in *Drosophila:* a preliminary report. B. Wallace. *Proceedings of the National Academy of Sciences* **43** (1957), pp. 404-407.

Recent experiments with fruit flies call for qualification of the generally accepted statement that the vast majority of new mutations are harmful. Wallace compared the viability or vigor of two types of flies produced by special breeding methods. Some of the flies were all homozygous for (had in duplicate) one chromosome obtained from a healthy fly parent. In the other flies the same chromosome was again present in duplicate, but one member of the pair had been received through an X-rayed intermediate generation so that it carried a variety of new random mutations. The latter group of flies proved superior to the former in controlled viability tests. In other words, in a population of fruit flies, the individual fly would suffer more on the average from receiving two doses of a given natural gene than from receiving one dose of the natural gene and a mutated copy of it.

It appears that fruit flies and many other animals are normally heterozygous at a great many points on their chromosomes or carry two different copies of many genes. These copies have been individually selected over many generations because they produce desirable effects in single dose, even though, when rarely in duplicate, they may be injurious. Such normal genes may be regarded as causing recessive defects. If this principle applies at all to man, it emphasizes the danger of eugenic measures designed to eliminate genes causing recessive diseases, especially those of frequent occurrence. It also indicates that nature has protected fruit flies and possibly man against new mutations better than against inbreeding.

Race and Evolution. S. M. Garn. *American Anthropologist* **59** (1957) pp. 218-224.

Human races can no longer be regarded as stable and original divisions of mankind. A

generation ago racial origins were placed in the remote past, and modern racial differences were assumed to have no adaptive value. Both of these conclusions now appear false. Racial differentiation is a perpetual process directed by selective forces now beginning to appear in the study of blood differences. Racial hybridization certainly requires analysis, but more challenging are the ongoing evolutionary changes within races—their directions and their precise causes.

A genetic survey of Huntington's chorea in the State of Michigan. T. E. Reed. *Supplement, Japanese Journal of Human Genetics* **2** (1957), pp. 48-53.

Huntington's chorea, a hereditary nervous disease apearing in middle life, has almost no net effect on fertility. A survey of Michigan revealed 204 living cases in 1940, a prevalence of about one case in 25,000. The prevalence in males was significantly lower than in females (about three-fourths as great), but ages of onset and death were similar for the sexes. A superficial analysis suggested a higher fertility in choreics than in their siblings, but this difference disappeared upon correction for deaths before disease onset. Affected females were, however, significantly more fertile than affected males. Cases due to new mutation appear to be infrequent; this gene may, in fact, have a mutation rate as low as any known for man.

Homozygous appearance of distal myopathy. L. Welander. *Acta genetica et Statistica Medica* **7** (1957), pp. 321-325.

Dominant hereditary diseases of man are usually known from herterozygous persons, who received the responsible gene from only one parent. The author reports a family of 16 children whose parents both had a benign dominant form of progressive muscular dystrophy. The parents had no common ancestors in at least two preceding generations. Seven of the children already showed muscular dystrophy; in 5 the disease was mild, as in the parents, but in two progression had been rapid and they were completely incapacitated for work. These probably carried two genes for the disease instead of the usual one.

In human inheritance, where experimental matings are impossible, cases like this are extremely valuable. They show, for instance, that most "dominant" diseases actually correspond to the "blending" inheritance of many traits in animals and plants.

Heredity in diabetes mellitus. J. Grunnet. *Acta Genetica et Statistica Medica* **7** (1957), pp. 97-100.

Evidence collected in Denmark indicates that the majority of cases of diabetes are hereditary and that the disease may result from multiple genes; severity in any given case probably depends on the number of mutant "diabetes" genes present. The author estimates that if all persons lived to age 80, six or seven per cent would be diabetic by that age. Patients with severe diabetes have a large proportion of diabetic children and siblings even at early ages. Their parents show a high incidence only in late ages, probably because early diabetes would have diminished the chance of parenthood. For siblings of mild diabetics the incidence is high only after age 40. This argues strongly for a genetic difference between the two levels of severity, but the division may not be a simple dichotomy.

Selective survival in dizygotic twins in relation to the ABO blood groups. R. H. Osborne and F. V. De George. *American Journal of Human Genetics* 9 (1957), pp. 321-330.

Among fraternal twins, the proportion of pairs with dissimilar ABO blood groups is significantly below that predicted by genetic theory. The apparent explanation is prenatal death of one or both partners in many pairs having incompatible blood.

Among 34 dizygotic pairs aged four to eight, 13 discordant pairs were expected and only three found; the discrepancy was similar in Negroes and Whites. Among another 60 dizygotic pairs who had survived to adulthood and were in good health, 21 discordant pairs were expected and 18 were found. To explain the near return to normal proportions in healthy adult twins, the authors suggest that the same interchange of fetal blood that is fatal prenatally to twins discordant for the ABO factors, causes illness or death at a later age in twins with similar ABO groups.

The numbers in this study are small and have only qualitative meaning. But the importance of extending the data and verifying the corollaries is seen from the following: If the reported juvenile rates should prove representative, it would appear that some three-fourths of all twins discordant for the ABO blood groups may be eliminated during gestation or infancy. Furthermore, a similar or larger proportion of the twins concordant for these factors would have survived a fetal circulatory anomaly.

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POPULATION

Socio-economic differentials in mortality from chronic diseases. John M. Ellis. *Social Problems* **5**, 1 (July 1957), 30-36.

The inverse relationship between the socio-economic status of groups and their mortality from infectious diseases is well known and is a major element in the mortality structure of areas with generally high death rates. As mortality declines, and chronic diseases become more important relative to infectious diseases, the question arises as to how mortality from chronic diseases is related to socio-economic status. To investigate this subject, Ellis examined white mortality data for the city of Houston, Texas, for the years 1949-1951. The census tracts of the city were grouped into five socio-economic categories according to a scheme used earlier by Dodson, and age-sex-standardized mortality rates were computed for each group.

The rates for deaths from all causes showed higher mortality for the lower socio-economic groups than for the higher, except that the highest rates for males and for both sexes combined were exhibited by the next-to-lowest socio-economic group rather than the lowest. Death rates for the seven leading diseases in Houston showed the strongest relationship between status and mortality for the infectious diseases, tuberculosis and pneumonia. The relationship also existed for chronic diseases, such as malignant neoplasms and heart disease, however, though with some irregularities in the pattern, notably a higher mortality from some causes in the highest socio-economic group than in the next lower group.

The author suggests that the higher death rates from chronic diseases among the lowest socio-economic groups may result from the organization and costs of medical treatment, which is often lengthy and expensive in such cases. The relatively poor showing of the highest socio-economic group, on the other hand, may be a product of greater tensions. As more publicity is given to the possibility of (often expensive) treatment of chronic diseases, the differentials in death rates from these causes may increase.

The fertility of teachers in England and Wales. Wolf Scott. *Population Studies* **11**, 1 (July 1957), 78-85.

The fertility of married male teachers by marriage cohort and duration of marriage is analyzed in this report on data collected in 1955 through mail questionnaires and personal interviews. The mean number of children was 1.41, and the mean for teachers married at least twenty years, 1.60. Whereas the mean declined from 1.81 for teachers married before 1920 to 1.47 for those married in the period 1930-1934, projection of the future performance of more recent cohorts on the assumption that past family-building patterns will continue leads to a mean family size in the neighborhood of 2.00 for teachers married immediately after the war.

The performance of teachers was not statistically different from that found by the Family Census of 1946 for salaried employees, professional workers, and employers of ten or more persons, in the case of cohorts for which comparison was possible. When account was taken of the fact that teachers' wives tend to be slightly younger than the wives of men in the comparable Family Census categories, it developed that teachers tended to have families somewhat smaller than those of other professional groups and about as large as those of salaried employees.

Readers should note that the data of Columns 4-6 of Table 6, p. 84, have not been arranged under the correct headings.

Some sources of variation in the family size of college graduates. Robert Gutman and Irving Bender. *Milbank Memorial Fund Quarterly* **35, 3** (July 1957), 287-301.

Data for 95 male graduates of an Ivy League college are studied in this report. Extensive social and psychological information about these men, collected in 1939-1940, their senior year, is combined with further information obtained in 1955 by mail questionnaires. The mean number of children for the group as of 1955 was 2.43. The mean ideal family size reported was 3.14, and the mean intended family size was 3.08. Almost no individuals expressed a preference for fewer than two or more than four children.

In an attempt to discover factors associated with variation in family size, some sixty characteristics were studied, including items related to social background, college career, post-college career, and various psychological attributes. Six items were found to be significantly related to family size: religion, regularity of church attendance, number of siblings of the respondent, duration of marriage, occupation, and degree of extroversion. In particular, the authors note the small relationship found between the psychological variables studied and family size, a result they find "curious." One might add that in view of the Indianapolis study it is not unprecedented.

As is usual when data collected for one purpose are the basis for investigating a different subject, the study is weakened by the absence of information on certain presumably relevant matters. Nonetheless, it is a worthwhile addition to the store of knowledge on factors affecting fertility.

The influence of economic conditions on the fertility of peasant women. W. Stys. *Population Studies* **11,** 2 (November 1957), 136-148.

In an investigation conducted in 1948 in twenty villages in southern Poland, information was obtained regarding size of family and size of farm for both wives and mothers of the peasants questioned. Grouping the wives by cohorts, each including persons born in a span of a few years, revealed that in each cohort there was a positive correlation between farm size and family size. Rich girls tended to marry younger and to bear more children than poorer girls. A steady decline in family size from cohort to cohort was also observed, more pronounced among large-farm families than small-farm families. This is attributed by the author to the spread of contraception, which is presumed to have been adopted earlier by the richer families.

A land-tenure system providing for division of farms among the children of a household tends to make the allotment of land received by individual children smaller than the parental farm. In the Polish villages, where such a system existed, the effect of the larger families found on larger farms was to foster an equalization of farm size, since the large farms were broken into more pieces than the smaller farms. Under conditions of high natural increase such a scheme of subdivision tends to worsen the economic situation of the farmers.

This paper is based on a larger study to be published in Polish. It is to be hoped that further data and information on the method of its collection will be made available in English.

The growth of village population and economic development in South Asia. Nathan Keyfitz. *Population Review* [Madras] **1,** 2 (July 1957), 39-43.

This paper discusses the problem of determining the most effective measures for dealing with a situation in which population growth, especially in rural areas, is producing increasing demands on the food supply. The author cites two instances in support of the contention that a tendency toward rapid population growth is likely in Asia under present conditions: in Ceylon disease control lowered the death rate from 20 per thousand in 1946 to 11 in 1955, while the birth rate held constant at 38, so that natural increase rose from 1.8 per cent to 2.7 per cent; special health measures in a model health area near Jogjakarta, Indonesia, lowered the death rate from 18 to 13 in four years, at the end of which time a birth rate of 43 implied a natural increase of about 3 per cent.

The relationship between agricultural and manufacturing production is elucidated by a simple model. If the rural population grows faster than the food it produces, the surplus

food available for trade with the cities will be reduced. In consequence, rural areas will have access to smaller quantities of manufactured products and city producers will find their markets growing smaller. On the assumption that the demand for food is less elastic than that for manufactured goods, and within the institutional arrangements of South Asia, there will be a tendency toward a lowered volume of industry, accompanied by an increase in the industrial use of more advanced, labor-saving techniques. Meanwhile, in agriculture the effects are likely to be smaller and of an opposite kind, namely, an increase in output and a shift toward more labor-intensive technology.

To the extent that the model describes the real situation, it implies that the introduction of labor-saving devices in rural areas where labor is the method of distributing output widely would not be useful and would result in greater inequality of incomes. In contrast, technically sound schemes for increasing the food supply might increase the maintainable manufacturing sector of the economy. As Keyfitz points out, further study of the applicability of his model seems worthwhile in view of the importance of the matters with which it deals.

Oral contraceptive in relation to population projection and future planning in India. S. N. Sanyal. *Man in India* **37,** 3 (July-September 1957), 199-207.

For an oral contraceptive. S. N. Sanyal. *Journal of Medicine and International Medical Abstracts and Reviews* **21,** 5 (January 1957), 5-8.

The first of these articles briefly summarizes the findings of several studies of population trends in India, notably one to be published shortly by Coale and Hoover of the Princeton University Office of Population Research and one by the Indian Statistical Institute. These studies indicate that considerable population growth in India during the next decades seems highly plausible. The author outlines the reasons for his belief that a satisfactory oral contraceptive is called for in this situation, and describes his findings with respect to a particular substance that appears to have potential value for this purpose.

The second article gives further information regarding this substance, meta-xylohydroquinone. A trial with several hundred female subjects is reported to have shown "a reasonable reduction in pregnancy rates." The method of measuring the effectiveness of the substance is not described, however. The reader gathers from subsequent paragraphs that the research has not thus far led to the goal of a satisfactory oral contraceptive, but that the author is hopeful.

Though the statement (*Man in India*, p. 205) that "the authorities on family planning, the demographers and the sociologists even of advanced countries are unanimous on the point that oral contraceptive is the only acceptable family planning measure" is perhaps an exaggeration, there can be no doubt that future work in this field will be followed with worldwide interest.

Antifertility drugs and morality. William J. Gibbons, S.J. *America* **98,** 11 (December 14, 1957), 346-348.

Recent scientific interest and progress in the development of new contraceptive methods lead the author to conclude that "a simple and presumably effective antifertility drug is in the offing." The purpose of this article is to indicate the moral implications of such a drug from the point of view of the Roman Catholic Church. A review of some of the Church's pronouncements on related topics, followed by a summary of current approaches to physiological fertility control, leads to the main issue.

Though the Church "is not automatically against every attempt of married couples to regulate fertility," the morality of the means employed is of great concern. Since the various drugs now under development "involve positive interference with normal function . . . in order to create physiological conditions hostile to conception and/or pregnancy . . . the new methods are morally wrong." (p. 347, last phrase italicized in original.) In passing, the author states that "were our increasing knowledge of reproductive function, of the female cycle and time of ovulation, used merely to render periodical continence more effective, no reason would exist for moral stricture."

It appears to the reviewer that neither Catholics nor non-Catholics are likely to find anything unexpected in Father Gibbons' discussion, though some readers will not be gratified by his conclusions.

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NEWS NOTES

Meetings

A symposium on Genetics in Medical Research was held at the University of Wisconsin, April 7-12. Geneticists from all over the world attended. Topics of special interest included these: Importance of Genetics of Mammalian Viruses in Medical Research, Bacterial Genetics and Infectious Disease, The Cellular Lesion in Radiation Injury, The Chromosomes of Man, Genes and Hemoglobins, Genetic Control of Blood Coagulation Processes, Selective Factors in the ABO Polymorphism. The symposium was supported by a grant from the Heart Institute of the National Institutes of Health, Public Health Service.

The Population Association of America held its annual meeting in Chicago, May 3-4. Dudley Kirk, Demographic Director of The Population Council, Inc., was chosen President-Elect. The following topics were discussed: Science of Demography, Changes and Population Policy in Canada, Demographic Aspects of Morbidity, Population of Communist China and the Soviet Union, New Departures in the Analysis of Fertility, Medical and Demographic Aspects of Sterility, Population Theory in Historical Perspective, Political and Economic Significance of Internal Migration.

The American Society for the Study of Sterility met in Los Angeles, April 18-20. Of particular interest to eugenics was a discussion of Genetic Aspects of the Abortion Problem by Dr. Edward C. Mann of the New York Hospital.

The fiftieth anniversary of The British Eugenics Society was celebrated at a jubilee dinner in London recently. Sir Charles Darwin presented the Galton Medal to Dr. C. P. Blacker, a supporter of eugenics for many years.

A symposium on Blood Genetics will be included in the program of the 7th Congress of the International Society of Hematology to be held in Rome in September 1958. Prof. Luigi Gedda is Vice-president of the Congress and President of the Symposium.

Research Findings

A pioneer study of cancer is being made in Connecticut to find out if the disease occurs more frequently in some families. This study of the relationship between cancer and heredity—if any—is being financed by the American Society, using records in the central cancer registry of the Connecticut State Health Department. Connecticut's records are the most comprehensive and accurate analysis of cancer incidence in the nation. They cover approximately 120,000 cases, dating back to the mid-1930s. Names of persons with cancer fifteen or twenty years ago will be checked and an attempt made to locate their descendants to discover additional cases. The project will be directed by Dr. Merton S. Honeyman of the United States Public Health Service.

A new anti-fertility compound, effective when taken by mouth, has been developed in tests on rats, report Drs. Sheldon J. Segal and Warren O. Nelson of the Laboratory of The Population Council, The Rockefeller Institute. When treatment with the new compound, known as MER-25, started on the day of mating and continued throughout the normal period during which the egg is implanted, implantation did not take place. This new oral contraceptive seems to act in the fallopian tubes to prevent descent of the fertilized egg to the womb. Tests so far have been carried out on rats, and the researchers state that no conclusions can be drawn yet about the efficacy of this compound as a contraceptive for people.

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